PB90-186479

Superfund Record of Decision (EPA Region 6)
Sheridan Disposal Services Site, Waller County, Texas
(Second Remedial Action), September 1989

(U.S.) Environmental Protection Agency, Washington, DC

27 Sep 89

U.S. Department of Commerce
National Technical Information Service
NTIS

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R06-89/051	2.	3. Recipient's Accession No. PB 90 186479 /AS
4. Title and Subtitle SUPERFUND RECORD OF DECISION Sheridan Disposal Services, TX Second Remedial Action - Final			5. Report Date 09/27/89 6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Orgainization Name and Address			10. Project/Task/Work Unit No. 11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460			13. Type of Report & Period Covered 800/000 14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 110-acre Sheridan Disposal Services site is approximately 9 miles northwest of the city of Hempstead in Waller County, Texas. The site is located on the 100-year floodplain of the Brazos River and is bordered by a lake to the south, farmland, and a community of 20 residences to the north. The Evangeline aquifer, which runs under the site, is used to meet the drinking water needs of several communities nearby. Sheridan Disposal Services operated as a commercial waste disposal facility from about 1958 to 1984 using steam distillation, open burning, incineration, and direct disposal into a waste lagoon to dispose of various organic and inorganic chemical and solid wastes. The site includes a 12 to 22-acre lagoon, a 17-acre dike surrounding the lagoon, a 42-acre evaporation/land irrigation system, and an incinerator and 9 waste storage and treatment tanks located on the lagoon dikes. The primary contaminants of concern affecting the soil and sludge are VOCs including benzene and toluene, and other organics including PCBs.

The selected remedial action for the site includes excavation of all material with PCB concentrations greater than 25 mg/kg including 13,000 yd3 of pond and dike soil, 31,000 yd3 of pond sludge, and 300 yd3 of floating oil and emulsion in the pond and storage tanks. This will be followed by onsite biotreatment of (Continued on next page)

17. Document Analysis a. Descriptors

Record of Decision - Sheridan Disposal Services, TX
Second Remedial Action - Final
Contaminated Medium: gw
Key Contaminants: VOCs (benzene, PCE, TCE), metals (arsenic)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 92
	20. Security Class (This Page) None	22. Price A05

(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R06-89/051
September 1989

PB90-186479

EPA

Superfund Record of Decision:

Sheridan Disposal Services, TX

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

16. Abstract (Continued)

contaminated soil, sludge, and oil with stabilization and onsite disposal of residuals in the pond. If PCB concentrations in the residuals are less than 50 mg/kg, they will be placed under a RCRA-compliant cap. Residuals with PCB concentrations greater than 50 mg/kg PCB will be placed in a RCRA-compliant landfill in the pond area. In addition, the remediation requires capping the entire pond and dike area; decontamination and offsite disposal of tanks, drums, and debris; treatment to best available technology (BAT) of any contaminated wastewater and stormwater with discharge to the river; implementation of engineering controls to prevent bank erosion on the river; and ground water monitoring. The estimated present worth cost for this remedial action is $27,956,000, which includes total O&M costs of $863,000.

PORTIONS OF THIS REPORT ARE NOT FULLY LEGIBLE DUE TO THE HISTORICAL NATURE OF SOME OF THE MATERIAL. HOWEVER, IT IS THE BEST REPRODUCTION AVAILABLE FROM THE COPY SENT TO NTIS.

RECORD OF DECISION

FOR

SHERIDAN DISPOSAL SERVICES SITE

WALLER COUNTY, TEXAS

(GROUND WATER MIGRATION MANAGEMENT OPERABLE UNIT)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 1989

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Sheridan Disposal Services site, Waller County, Texas

STATEMENT OF PURPOSE

This decision document outlines the selected remedial action for the second operable unit at the Sheridan Disposal Services site in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, November 20, 1985.

On December 29, 1988, a Record of Decision (ROD) was signed which selected the appropriate remedial action for the Source Control Operable Unit for the Sheridan site. The Source Control ROD addressed the risks associated with exposure to contaminated soils and sludges on the site.

This document is the ROD for the second operable unit, hereafter referred to as the Ground Water Migration Management, or GWMM unit. The ROD for the GWMM unit addresses the risks associated with the potential or actual exposure to contaminated ground water.

The State of Texas (through the Texas Water Commission) has been provided an opportunity to comment on the technology and degree of treatment proposed by the Record of Decision. The letter describing the State's concurrence with the selected remedy is found in Appendix C.

STATEMENT OF BASIS

This decision is based on the administrative record for the Sheridan site. The index found in Appendix A identifies the items which comprise this administrative record.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

Upon review of the information contained in the administrative record, it is EPA's judgment that the natural attenuation alternative best serves both statutory and selection criteria in relation to the other solutions evaluated. A detailed description of this remedy and an explanation of how it meets statutory requirements is contained in the attached "Summary of Remedial Alternative Selection."

Implementation of the natural attenuation alternative requires the following components:

1. The establishment of Alternate Concentration Limits (ACLs) as the site ground water protection standards.

2. Ground water monitoring to ensure ACLs are not exceeded.

3. Sampling and analysis of the Brazos River immediately downgradient and upgradient of the point of entry of ground water from the site into the river.

4. Implementation of controls to preclude potential use of contaminated ground water.

5. In the event ACLs are exceeded at sometime in the future, the implementation of a corrective action plan to ensure that protective levels are met at the point of potential exposure.

Implementation of these activities addresses the principal threat posed by the site by preventing exposure to contaminated ground water and by maintaining safe levels in the Brazos River.

STATUTORY DETERMINATIONS

The remedy described above is protective of human health and the environment, attains Federal and State applicable or relevant and appropriate requirements and is cost-effective. This remedy satisfies the statutory preference for remedies that utilizes permanent solutions and alternative technologies to the maximum extent practicable. However, this remedy does not satisfy the statutory preference for treatment as a principal element because treatment of ground water contamination was found to be impracticable. Further, it should be noted that the Source Control remedy utilizes treatment as a principal element.

Because this remedy may result in hazardous substances remaining onsite above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Robert E. Layton Jr.

Robert E. Layton Jr., P.E.,
Regional Administrator

Sept. 27, 1989
Date

SHERIDAN DISPOSAL SERVICES SITE

WALLER COUNTY, TEXAS

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

SEPTEMBER, 1989

TABLE OF CONTENTS

	PAGE
I. SITE LOCATION	1
II. HISTORY AND ENFORCEMENT	1
III. HIGHLIGHTS OF COMMUNITY PARTICIPATION	2
IV. SCOPE AND ROLE OF OPERABLE UNIT	3
V. SITE CHARACTERIZATION	3
5.1 Geology	3
5.2 Hydrogeology	3
5.3 Samplings Results	4
VI. SUMMARY OF SITE RISKS	4
VII. ALTERNATIVE EVALUATION	6
7.1 Evaluation Criteria	6
7.2 Description of Alternatives	8
7.3 Evaluation of Alternatives	9
VIII. SELECTED REMEDY	12
8.1 Description of Selected Remedy	12
8.2 Rationale for Selection of the Remedy	15
IX. STATUTORY DETERMINATIONS	17
9.1 Protection of Human Health and the Environment	18
9.2 Compliance with Applicable or Relevant and Appropriate Requirements of Other Laws	18
9.3 Cost-Effectiveness	19
9.4 Utilization of Permanent Remedies and Alternative Treatment Technologies to the Maximum Extent Practicable	19
9.5 Preference for Treatment as a Principle Element	20
X. DOCUMENTATION OF NO SIGNIFICANT CHANGES	20

XI. APPENDICES

A. Administrative Record

B. Responsiveness Summary

C. State Response to Record of Decision

LIST OF FIGURES

FIGURE NUMBER	TITLE
1	General Site Location Map
2	Site Location Map
3	Site Plot Plan
4	General Schematic of Site Geology
5	Approximate Extent of Ground Water Contamination
6	Alternative 2: Partial Slurry Wall Alignment
7	Alternative 3: Recovery Well Configuration
8	ACL Points of Compliance

LIST OF TABLES

TABLE NUMBER	TITLE
1	Geologic Description and Water-bearing Properties of the Geologic Units forming the Aquifers in Waller and Austin Counties
2	Summary of Highest Levels of Contaminants Detected in Shallow Ground Water
3	Summary of Alternative Costs

I. SITE LOCATION

The Sheridan Disposal Services site is located approximately nine miles north-northwest of the City of Hempstead in Waller County, Texas. The site covers about 110 acres in a 700-acre tract of land which is bordered by the Brazos River to the north and Clark Road to the South (See Figures 1 and 2).

Located at the site are a lagoon (12-22 acres depending on water levels), a 17-acre dike surrounding the lagoon, and a 42-acre evaporation/land irrigation system. An incinerator and a group of nine storage tanks which were used for waste storage and treatment are located on the lagoon dikes. These site features are illustrated in Figure 3.

The predominant land-use within a four-mile radius of the site is agriculture and range land. The only primarily residential area within this four-mile radius is the community of Brown College. This community is made up of approximately 20 residences and is located one and one half miles north of the site. Nearby communities primarily utilize ground water from the Evangeline aquifer to meet their water supply needs.

The site is relatively flat, but slopes gently to the south. It lies within the 100-year floodplain of the Brazos River. However, the lagoon dikes have been built up to an elevation above that of the floodplain.

II. SITE HISTORY AND ENFORCEMENT

Sheridan Disposal Services operated as a commercial waste disposal facility from about 1958 to 1984. A wide variety of organic and inorganic chemical and solid wastes were disposed of at the site. The facility treated waste by steam distillation, open burning and incineration. The lagoon was developed in a low-lying area of the site and was used as a holding pond, and for the disposal of overflow wastes and waste treatment residues. In 1976, the facility initiated use of the evaporation system for disposal of water which accumulated on the lagoon.

The site's regulatory history began in 1963 when the Texas Water Quality Board (now known as the Texas Water Commission) issued a permit authorizing disposal of industrial solid waste. After permitting, the Texas Water Quality Board (TWQB) received complaints concerning odor, runoff and oil in the Brazos River. The State also noted increased concentrations of contaminants in on-site monitoring wells.

In 1970, the TWQB and Waller County filed suit against the Sheridan facility. After a series of meetings and public hearings, in 1975, a judgement was entered by the Court which prohibited further discharge of wastes into the lagoon. The TWQB and Sheridan Disposal Services discussed numerous closure plans for the lagoon until the TWQB determined that the facility did not have the economic or technical resources necessary to close the lagoon properly. In 1984, the Texas Department of Water Resources (successor of the TWQB) sent letters to generators and transporters of waste managed at the site to notify them of their potential liability under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

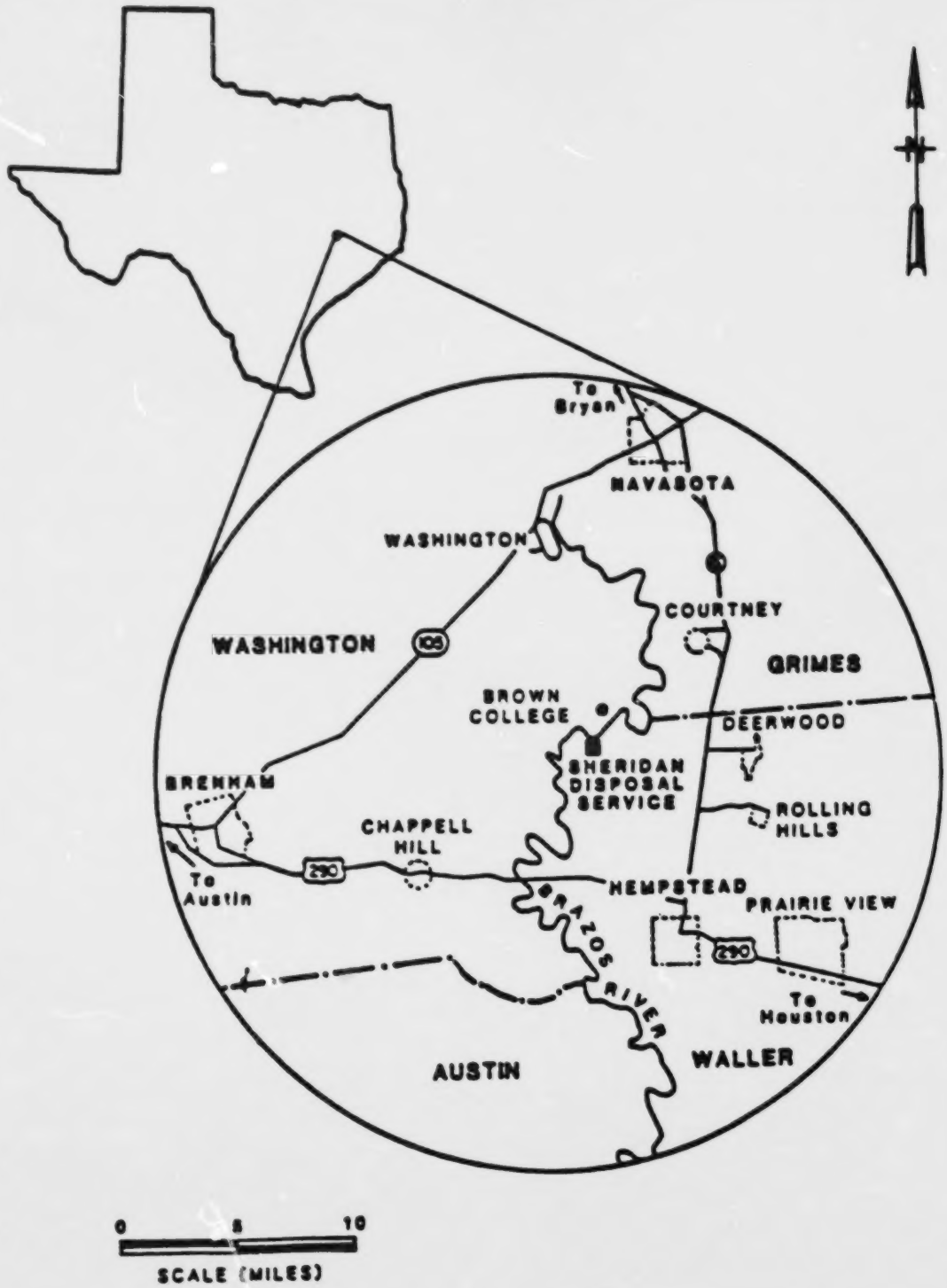

FIGURE I
SITE LOCATION MAP
SHERIDAN DISPOSAL SERVICE

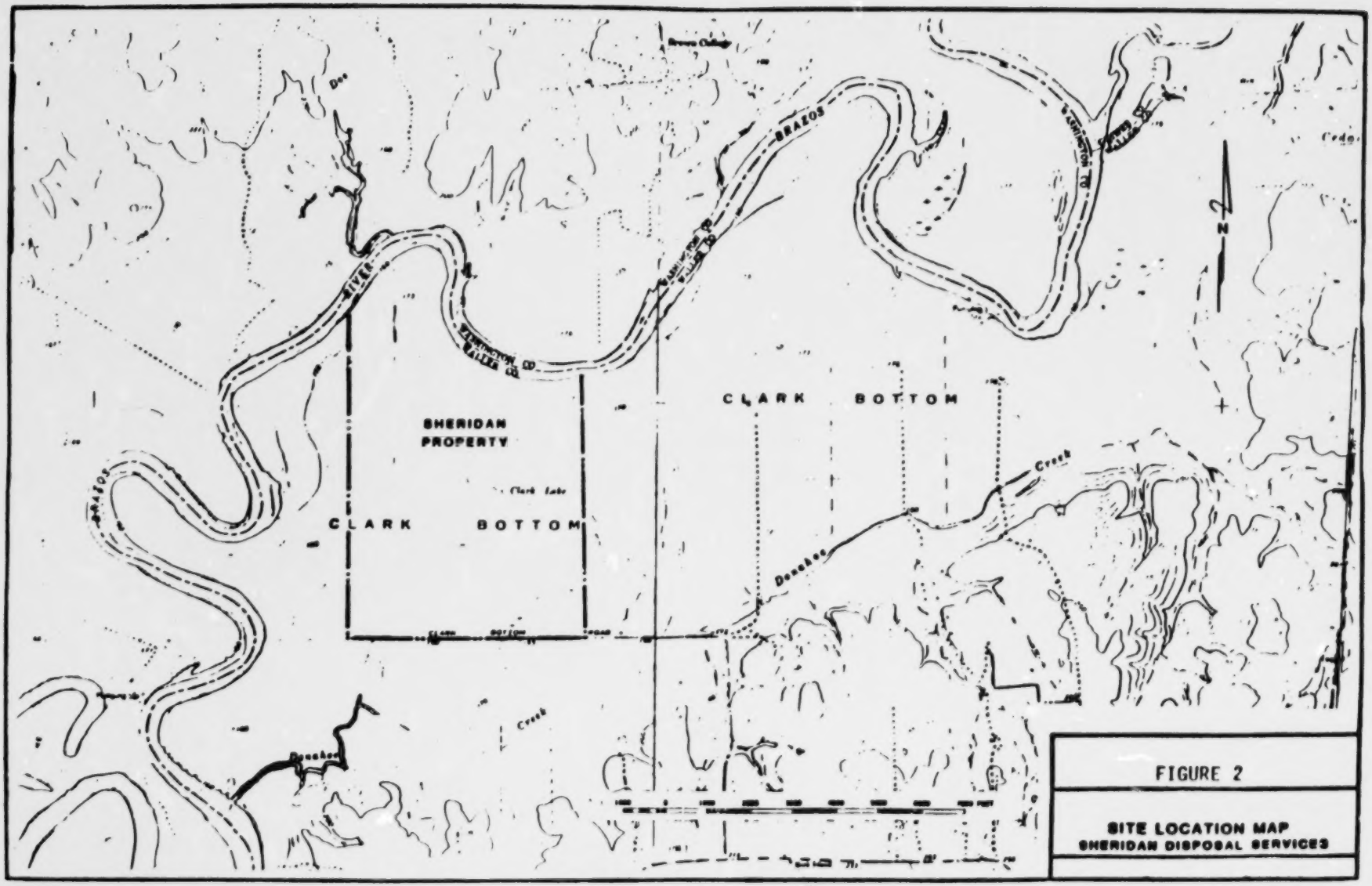

FIGURE 2

SITE LOCATION MAP
SHERIDAN DISPOSAL SERVICES

In response to this notification, the Sheridan Steering Committee, which is now known as the Sheridan Site Committee, organized and began to investigate the extent of contamination at the site. After polychlorinated biphenyls (PCBs) were identified in the lagoon, EPA became directly involved in site closure through the Toxic Substances Control Act. The site was ranked according to the Superfund Hazardous Ranking System and on June 10, 1986, the site was proposed for inclusion on the National Priorities List. The basis for inclusion on the NPL was primarily the volume, toxicity and mobility of contaminants found at the site and ground water contamination resulting from the site.

In June and July of 1986, 102 Notice/Information request letters were sent to site Potentially Responsible Parties (PRPs). During this time, the Sheridan Site Committee submitted a Remedial Investigation to EPA for evaluation. After reviewing this document the Agency determined that additional field investigations would be necessary to obtain adequate information on which to base a ground water remedy decision. However, in order to expedite lagoon cleanup and reduce further leaching into ground water, the site was divided into two operable units, a Source Control unit which was addressed in a previous ROD and the Ground Water Migration Management (GWMM) unit which is addressed in this ROD.

On February 3, 1987, 59 companies who were members of the Sheridan Site Committee entered into an Administrative Order on Consent with EPA to complete both the Source Control and GWMM remedial investigation/feasibility studies (RI/FSs). In 1988, EPA issued a unilateral order to site PRPs to lower the level of water in the lagoon. This action was implemented by the Committee's contractor with EPA oversight.

After the ROD for the Source Control operable unit was issued, additional Notice/ Information request letters were issued and Special Notice letters informing PRPs of the Remedial Design/Remedial Action (RD/RA) Moratorium period were submitted to over 180 PRPs. The Sheridan Site Committee, the Department of Justice (DOJ) and EPA have reached a tentative agreement for Source Control remediation.

EPA will continue its enforcement activities and send Special Notice Letters to PRPs prior to the initiation of the remedial design of the GWMM operable unit. Should the PRPs decline to conduct future remedial activities, EPA will either take enforcement actions or provide funding for these activities while seeking cost recovery for all EPA-funded response actions from the PRPs.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In general, there has been a long history of citizen awareness of the Sheridan Disposal Services site. In the early 1970s when incineration at the site resulted in air emissions, people living within a 7-mile radius complained. In 1971 a citizens' group submitted a petition with over 500 signatures to the Texas Water Quality Board calling for its closure. However, community concerns of either the area residents or local officials are now very low, probably because the site has been inactive since 1984. Also the site is relatively remote and there are no residences within a mile.

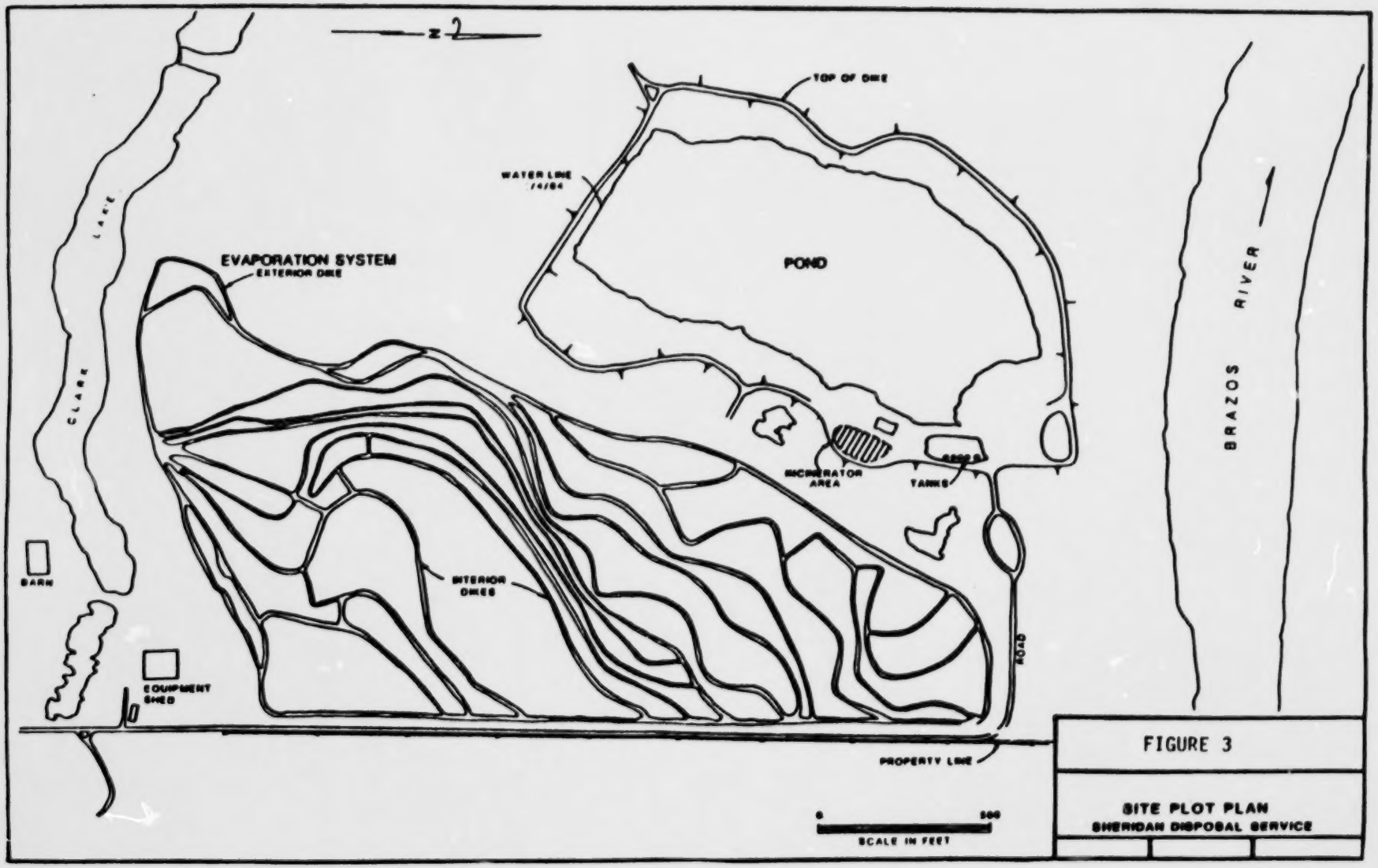

FIGURE 3

SITE PLOT PLAN
SHERIDAN DISPOSAL SERVICE

The proposed plan fact sheet announcing the public comment period and opportunity for a public meeting for the ground water portion of the site was distributed on July 31, 1989. The comment period began on August 14, 1989 and ended on September 11, 1989. No one responded to the offer of a public meeting and none was held. No written comments or questions were received by EPA.

IV. SCOPE AND ROLE OF OPERABLE UNIT

This ROD describes the remedy selection process for the second operable unit, which is known as the Ground Water Migration Management (GWMM) unit. The function of this operable unit is to prevent potential exposure to contaminated ground water and ensure protective levels are maintained in the Brazos River.

The ROD for the Source Control Operable unit at the site was issued in December 1988. The Source Control ROD addressed the risks associated with exposure to contaminated soils and sludges from the site.

V. SITE CHARACTERIZATION

5.1 GEOLOGY

The Sheridan site lies on the Brazos River Alluvium of recent age, which is comprised of gravel, sand, silt and clay deposited by the meandering river. The Brazos River Alluvium unconformably overlies the Miocene-aged Fleming formation. The Fleming is made up of interbedded sand and clay layers. Table 1 provides a general description of the hydrogeologic units present in Waller and Austin counties. However, all formations from the Goliad sand to the Beaumont clay are not present beneath the site.

According to the Austin sheet of the Geologic Atlas of Texas, no faults with surface expression occur in the vicinity of the site. Field investigations conducted by the responsible parties' contractor verified this conclusion. The Hockley escarpment and salt dome are found about 18 miles south of the site and the Millican fault zone lies approximately 20 miles to the north. However, there is no evidence that these features influence the hydrogeology of the site.

5.2 HYDROGEOLOGY

The alluvium of the Brazos River forms the first Regional aquifer beneath the site. The Evangeline and Jasper aquifers underlie the alluvium. Most wells in the vicinity of the site tap the Evangeline aquifer, which is about 450 feet thick beneath the site.

Figure 4 describes a general cross-section of site hydrogeology. The first water-bearing unit, which is referred to as the shallow aquifer, is identified in the cross-section as Stratum B. This aquifer is part of the sediments of the Brazos River Alluvium. The second water-bearing unit, know as the deep aquifer, is identified as Stratum D. This unit is part of the Evangeline aquifer. The clay layer know as Stratum E lies beneath the confined aquifer at about 100 feet in depth and was the deepest unit investigated at the site.

Table 1

Geologic description and water-bearing properties of the geologic units forming the aquifers in Austin and Waller Counties

Aquifer	Stratigraphic unit	Estimated thickness in area (feet)	General composition in Austin and Waller Counties	Surface expressions	Water-bearing properties in Austin and Waller Counties
Alluvial	Tributary alluvium and flood-plain alluvium of the Brazos River	0- 80	Unconsolidated gray, brown, and reddish-brown clay, silt, and sandy clay, commonly overlying light-colored sand or coarser-grained sand and gravel.	Occurs along the banks of smaller streams and in the flood plain of the Brazos River. Nearly flat plain. Forms reddish to dark-brown and black soils.	Yields small to large amounts of fresh water in the flood plain of the Brazos River.
Beaumont	Beaumont Clay	0- 75	Mottled red, reddish-brown, brown and gray, dense clay with white calcareous nodules. May contain lenses of fine and medium-grained sand or sand and gravel in places.	Occurs only along the fringes of the Brazos River flood plain. Forms nearly flat, narrow plain. Soils are gray to black, heavy.	Yields small to moderate amounts of water to scattered shallow wells less than 100 feet deep along the edge of the Brazos River flood plain.
Beaumont	Montgomery Formation	0- 40?	Light gray to light brown, fine-grained sand, silt, and clay, probably grading with depth to darker-colored coarser sand and in places basal sand and gravel.	Nearly flat, featureless plain; soils are light colored, fine-grained sandy. Occurs only along southern edge of area.	Yields small amounts of water to scattered shallow wells.
Beaumont	Bentley Formation	0- 50?	Alternating beds of reddish-brown to yellow and gray, mottled clay interbedded with grayish, fine- to coarse-grained sand and gravel lenses. Scattered lentils of lime-cemented sandstone. Clay, sandy clay, and fine sand predominate in the upper part, darker-colored coarser sand and gravel in the lower part.	Forms flat plains in the southern one-third of the counties; most of the rice-growing area is on the outcrop. Forms light-colored sandy loam soils.	Contributes small to moderate amounts of fresh water to domestic wells in the southern part of the area; probably represented by the uppermost sands screened in these wells.
Beaumont	Willis Sand	0- 240?	Alternating beds of mottled red, yellow, brown, and gray clay and sand with scattered lenses unsorted sand and quartz gravel. Ferruginous nodules common. Packed and hard in fresh exposures. Basal part is usually a hard, gravelly sand and clay.	Forms the gently-rolling sand hills of northern Waller County and central Austin County. Most of the gravel pits in Austin County are in the basal Willis. Forms tan sandy soils.	Yields small to large amounts of fresh water to wells.
Beaumont	Goliad Sand	0- 840?	White to gray, sticky, calcareous clay with interbedded lenses of light-colored, gravelly sand and lime-cemented sandstone. Black chert grains in the whitish sand give a salt and pepper effect.	Occurs as isolated surface exposures because the Goliad is overlapped by the Willis Sand or is easily removed by erosion. Forms gray, sticky soils. Usually occurs along valley bottoms and walls.	Yields large amounts of fresh water to wells.
Beaumont; Burkeville Aquiclude	Fleming Formation	0-1,700	Interbedded clay and sand; clay predominantly in the upper part. The blocky, dense clay is various shades of gray, yellow, olive, and brown. White calcareous nodules are common. Sand is gray to brown, brown, interbedded with gray clay. Sand is medium to fine grained and often cross-bedded.	Forms the rolling and dissected topography of northern Austin County. Forms gray to black loam and sandy loam soils.	Yields small to large amounts of fresh to slightly saline water.
Jasper	Catahoula Sandstone	?	Alternating beds of gray clay, tuff, and sand. Lower sands may be hard, white, and have opaline appearance.	Does not crop out in Austin or Waller Counties. Difficult to distinguish from overlying Fleming Formation in both surface exposures and in well logs.	May yield small amounts of fresh water in the most northern part of Austin County. Generally water is at least slightly saline.
Jasper	Undifferentiated	—	Alternating beds of gray sand, sandstone, and shale.	Does not crop out in Austin or Waller Counties.	Would yield only saline water

Source: Texas Water Development Board, Report 68

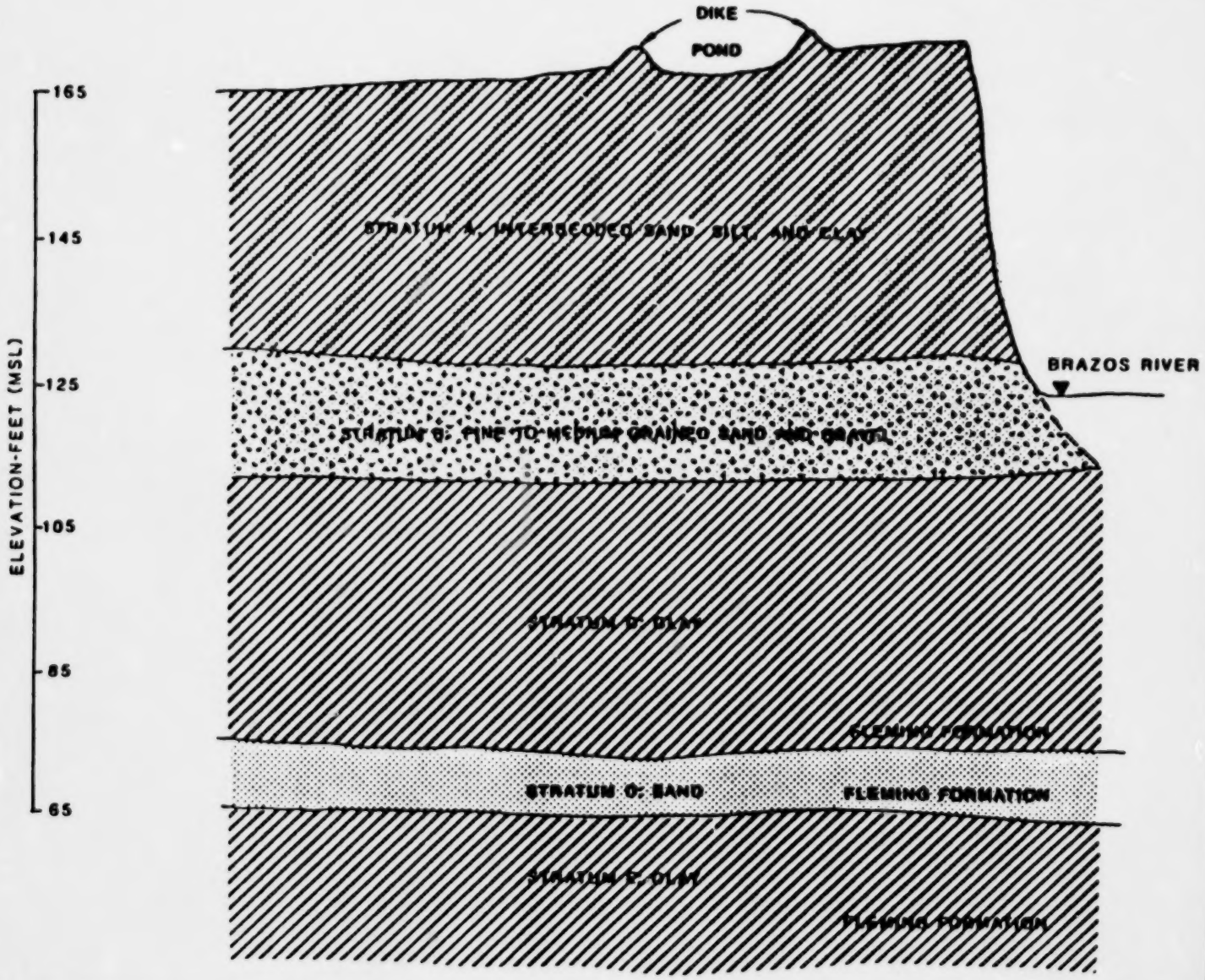

FIGURE 4
GENERAL SCHEMATIC SITE GEOLOGY
SHERIDAN DISPOSAL SERVICE

Ground water in the water table and confined aquifers generally flows towards the river, in a northwestern direction. However, during high river stage conditions (less than about one third of the time) ground water flow in the water table aquifer may shift to the west and south. The predominant vertical hydraulic gradient is upwards from the confined aquifer towards the water table aquifer.

5.3 SAMPLING RESULTS

A. Soil and Sludge

The results of the soil and sludge sampling may be found in the site Source Control RI/FS and risk assessment. Both organic and inorganic (metal) contaminants were detected at the site. The most significant contaminants in terms of toxicity and mobility are PCBs, benzene, toluene and trichloroethylene. A summary of this information is found in EPA's ROD dated December, 1988.

B. Surface Water

Sampling of the Brazos River downstream and upstream of the site indicated that there was no measureable difference in water quality between the downstream and upstream samples. Sediment samples were also obtained from the river bottom at locations downstream and upstream of the site. Concentrations of organic constituents indicated that the site had not impacted the sediment however, concentrations of metals were slightly higher in the downstream sample than the upstream sample. Analyses of Clark Lake water and sediments do not exhibit elevated levels of site contaminants.

C. Ground Water

Over thirty wells have been installed at the site in both the shallow and deep aquifers to determine the extent of contamination and evaluate site hydrogeology. Table 2 shows the highest levels of contaminants detected in the shallow wells to date and Figure 5 illustrates the extent of contamination in the shallow aquifer. No contamination has been detected in the deep aquifer. The only significant group of contaminants identified in the shallow ground water are volatile organics. However, the Maximum Contaminant Level (MCL) for arsenic was exceeded in one well by .01 ppm during one sampling period. The highest concentration of contaminants detected during recent sampling was benzene, at 130 ppb.

D. Air

Extensive air sampling has been completed at the site. No priority pollutant constituents were detected at concentrations above ambient background levels.

VI. SUMMARY OF SITE RISKS

The assessment of risk posed by the Sheridan site was evaluated in the Sheridan Risk Assessment. This assessment examined the amount, concentration, properties, and environmental fate and transport of chemical found at the site; the populations and environments potentially at risk; exposure

Table 2

Summary of Highest Levels of Contaminants Detected in Shallow Ground Water
for
SHERIDAN DISPOSAL SERVICES SITE

Well Number:		MW3	MW12	MW34	MW37	MW38	MW39
Sampling Dates:		6/84	Upgradient 4/89	10/87 (4/89)	10/87 (4/89)	10/87 (4/89)	10/87 (4/89)
Contaminant	Units						
Benzene	ppb	ND	ND	27 (130)	ND	ND	ND
Tetrachloroethylene	ppb	ND	ND	ND	13 (18)	21	ND
Trans-1,2 dichloroethylene	ppb	ND	ND	25 (30)	5.2 (6.1)	43	ND
Trichloroethane	ppb	ND	ND	15 (14)	ND	13 (10)	ND
Chlorodibromomethane	ppb	11	ND	ND	ND	ND	ND
Chloroform	ppb	60	ND	ND	ND	ND	ND
Dichlorobromethane	ppb	63	ND	ND	ND	ND	ND
1,1,1-trichloroethane	ppb	11	ND	ND	ND	ND	ND
Isophorone	ppb	30	ND	ND	ND	ND	ND
Arsenic	ppb	NA	ND	ND	ND	ND	43 (60)
Copper	ppb	NA	78*	ND	ND	6	8
Selenium	ppb	NA	ND	ND	ND	ND	ND

ND - Not detected, detection limits differ slightly for each sampling event

NA - Not Analyzed

* Anomolously high levels of copper were detected in upgradient wells in April 1989. Since copper is not a site contaminant and it was found in highest concentrations in upgradient locations distant from the waste areas, it is thought to result from sampling apparatus, off-site hydrocarbon recovery operations, or landowner activities.

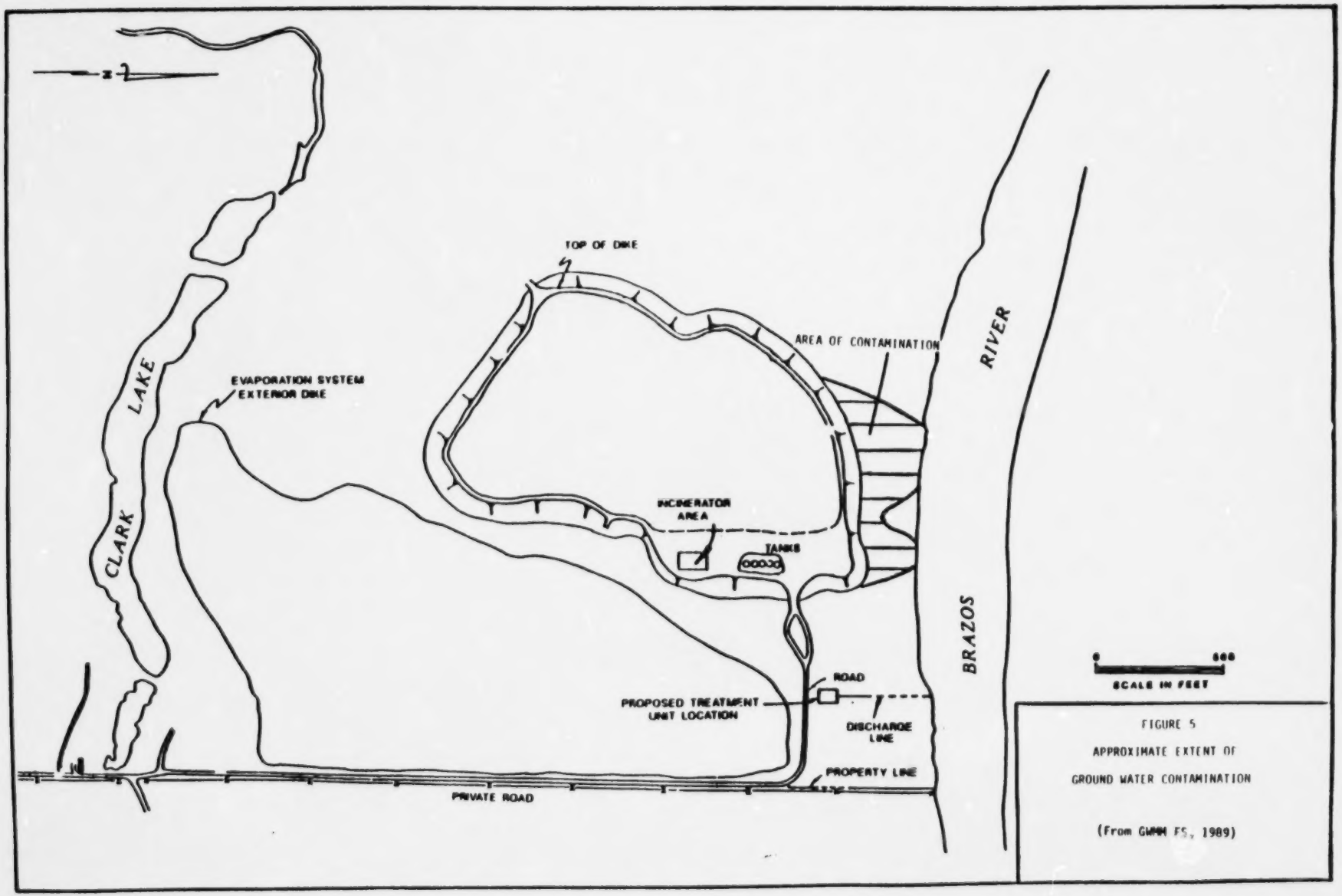

FIGURE 5

APPROXIMATE EXTENT OF GROUND WATER CONTAMINATION

(From GWMH FS, 1989)

pathways; and potential exposure events. The document described the risks associated with current and future (probable and worst-case) exposure scenarios. The numerical cancer risk values discussed below are theoretical quantifications of the excess lifetime cancer risk, that is, the increased probability of contracting cancer as a result of exposure to wastes, compared to the probability if no exposure occurred. For example, a 10^{-6} excess cancer risk represents an exposure that could result in one extra cancer case per million people exposed.

Three scenarios were developed in the site risk assessment. The first scenario evaluated is for current conditions which assume restricted site access and maintenance of the site. The second scenario addresses the risks associated with the most probable future land use conditions. These conditions assume continued agricultural (rangeland) use and unrestricted access to wastes. The third scenario describes the risks associated with the worst-case future scenario of residential development adjacent to the waste areas.

Under current conditions which assume restricted site access and maintenance of the site, the only potentially significant pathway is migration of contaminants into the Brazos River. This pathway was modelled using very conservative assumptions, resulting in an upper bound excess cancer risk from the ingestion of PCBs in fish of 1.5×10^{-5} (1.5 excess cancer cases per 100,000 people exposed). Modelling using less conservative assumptions indicated that the 1×10^{-6} excess cancer risk would not be exceeded. However, it should be noted that both models assume essentially all of the source will leach into the ground water over time; This is not expected to occur since the majority of contamination will be addressed by the Source Control remedy.

The second scenario evaluated was the most probable future land use which assumed continued agricultural (rangeland) land use and unrestricted access to the waste disposal area. This scenario differs from the first only with regard to exposure to lagoon sludges which is addressed in the Source Control ROD. Therefore, the risks associated with this scenario are identical to the first.

The last scenario evaluated in the Risk Assessment is the worst-case scenario of residential development adjacent to the waste areas. The pathway previously described for the current-use scenario of migration of contaminants into the Brazos River would be similar in the residential scenario. However, an additional exposure pathway of ingestion of contaminated ground water would result in a total excess cancer risk greater than 1×10^{-3} as well as a significant non-carcinogenic risk posed by phenol (Hazard Risk [1] of 15). Phenol is potentially the most significant non-carcinogenic contaminant which could could impact ground water.

The preceding paragraphs describe potential impacts to human health. Analyses of water and sediments in the Brazos River indicate that the ground water is not adversely impacting potential environmental receptors in the Brazos River.

---

[1] The risk for a non-carcinogenic compound is described by a Hazard Index. A hazard index is the ratio of the contaminant concentration to EPA's reference dose for the contaminant. A value greater than one indicates that the ambient concentration of a contaminant is higher than the acceptable reference dose, and may be significant.

The actual or threatened releases of hazardous substances from the site described above, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

VII. ALTERNATIVE EVALUATION

7.1 EVALUATION CRITERIA

In accordance with Section 121 (a), (b), and (d) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC Section 9621(a)(b) and (d), EPA has determined that nine factors must be considered in selecting a remedy for a Superfund site. Two of the criteria, Protection of Human Health and the Environment and Consistency with Other Laws, are known as Threshold Criteria which must be met. Long-term Effectiveness and Permanence, Reduction of Toxicity, Mobility, or Volume, Short-term Effectiveness, Implementability and Cost are considered to be Primary Balancing Criteria. Modifying Criteria include State Acceptance and Community Acceptance. These criteria are summarized below:

A. Overall Protection of Human Health and the Environment

Following the analysis of the remedial options against individual evaluation criteria, the alternatives are assessed from the standpoint of whether they provide adequate protection of human health and the environment.

B. Consistency with Other Environmental Laws

In determining appropriate remedial actions at Superfund sites, consideration must be given to the requirements of other Federal and State environmental laws, in addition to CERCLA as amended by SARA. Primary consideration is given to attaining applicable or relevant and appropriate Federal and State public health and environmental laws and regulations and standards. Not all Federal and State environmental laws and regulations are applicable to each Superfund response action. The compliance of each remedial alternative with all applicable or relevant and appropriate environmental laws is discussed in Appendix C.

C. Long-term Effectiveness and Permanence

Alternatives are assessed for the long-term effectiveness and permanence they afford along with the degree of certainty that the remedy will prove successful. Factors considered are:

- o Magnitude of residual risks in terms of amounts and concentrations of wastes remaining following implementation of a remedial action, considering the persistence, toxicity, mobility, and propensity for bioaccumulation of such hazardous substances and their constituents;
- o type and degree of long-term management required, including monitoring and operation and maintenance;
- o potential for exposure of human and environmental receptors to remaining waste considering the potential threat to human health and the environment associated with excavation, transportation, redisposal, or containment;

- o long-term reliability of the engineering and institutional controls, including uncertainties associated with the land disposal of untreated wastes and residuals; and

- o potential need for replacement of the remedy.

D. Reduction of Toxicity, Mobility or Volume

The degree to which alternatives employ treatment that reduces toxicity, mobility or volume must be assessed. Relevant factors include:

- o the treatment processes the proposed solutions employed and materials they treat;

- o the amount of contaminated materials that will be destroyed or treated;

- o the degree of expected reduction in toxicity, mobility, or volume;

- o the residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity for bioaccumulation of such hazardous substances and their constituents.

E. Short-term Effectiveness

The short-term effectiveness of an alternative must be assessed considering the following:

- o Magnitude of reduction of existing risks; and

- o short-term risks that might be posed to the community, workers, or the environment during the implementation of an alternative including potential threats to human health or the environment associated with excavation, transportation, and redisposal or containment.

F. Implementability

The ease or difficulty of implementing the alternatives are assessed by considering the following factors;

- o Degree of difficulty associated with constructing the solution;

- o expected operational reliability of the treatment technology;

- o need to coordinate with and obtain necessary approvals and permits (or meet the intent of any permit in the case of Superfund actions);

- o availability of necessary equipment and specialists; and

- o available capacity and location of needed treatment, storage, and disposal services.

G. Cost

The types of costs that should be assessed include the following:

- o Capital costs;
- o operation and maintenance costs;
- o net present value of capital and operation and maintenance cost; and
- o potential future remedial action costs.

H. State Acceptance (through the Texas Water Commission)

Evaluation includes assessment of:

- o Components of remedial alternatives that the State supports;
- o features of the alternatives about which the State has reservations; and
- o elements of the alternatives which the State strongly opposes.

I. Community Acceptance

This assessment should evaluate:

- o Components of remedial alternatives that the community supports;
- o features of the alternatives about which the community has reservations; and
- o elements of the alternatives which the community strongly opposes.

EPA is also directed by SARA to give preference to solutions that utilize treatment to remove contaminants from the environment. Offsite transport and disposal without treatment is the least preferred option where practicable treatment technologies are available.

7.2 DESCRIPTION OF ALTERNATIVES

In conformance with the National Contingency Plan (NCP), initial remedial approaches were screened to determine which might be appropriate for this site (see the Sheridan Disposal Services GWMM Feasibility Study for details of this evaluation). From these possible remedies, three were chosen for more detailed evaluation and comparison with the remedy selection criteria outlined above. In addition, "No Action" was evaluated to comply with the requirements of the NCP. Each remedy is summarized below.

All of the alternatives have some parts in common. They all require ground water monitoring to track the position of the plume of contamination. Additionally, all alternatives include the use of institutional controls to prevent the use of contaminated ground water. Finally, in the two alternatives which involve ground water treatment, ground water will be treated to meet ARARs and discharged into the Brazos River.

Alternative 1 - Natural Attenuation

This alternative relies on lowering contaminant concentration through natural processes such as sorption, dispersion and biodegradation. Surface water monitoring in the Brazos River will also be conducted to ensure that protective levels are maintained in the river. It will require a minimum of thirty years for contaminants at the upgradient edge of the plume to move through the hydrogeologic system. The cost of this alternative is approximately $326,000.

Alternative 2 - Partial Slurry Wall with Ground Water Treatment

This alternative involves the construction of a 65 foot deep low permeability slurry wall at the downgradient edge of the contamination plume (Figure 6). The slurry wall will intercept contaminated ground water and channel it towards extraction wells located at the center and ends of the slurry wall. Contaminants in the extracted ground water will be treated onsite by passage through a granulated activated carbon (GAC). It is expected to take approximately 25 years for ground water at the upgradient edge of the plume to reach the slurry wall for recovery and treatment. The cost of this alternative is approximately $4.2 million dollars.

Alternative 3 - Recovery Wells with Ground Water Treatment

This alternative involves placement of a line of wells near the downgradient edge of the contamination plume (Figure 7). Ground water will be extracted by these wells and treated onsite by passage through GAC. It is expected to take about 25 years for contaminated ground water at the far edge of the plume to be recovered by the wells and treated. The cost of this alternative is estimated to be about $5.3 million dollars.

It should be noted that the cleanup timeframes described for the alternatives described above are based on the time necessary to move one pore volume of contaminated ground water through the aquifer and do not account for desorption of contaminants bound to the aquifer. These timeframes will be considerable longer (i.e., 90 years) since additional pore volumes of ground water are expected to be necessary to remove contaminants bound to the aquifer.

Alternative 4 - No Action

The No Action alternative does not provide for any capital improvements or other activities to address the ground water contamination. With no action, potential exposure to contaminated ground water is not prevented and potential impacts on the river not controlled. However, Superfund regulations require that this alternative be evaluated as a basis for comparison to other alternatives.

7.3 EVALUATION OF ALTERNATIVES

The following values were assigned to compare remedial selection criteria:

"+" Alternative should exceed a criterion in comparison to other alternatives.
"." Alternative should meet the selection criterion.
"-" Alternative will not meet a criterion, or will not meet a criterion as well as other alternatives.

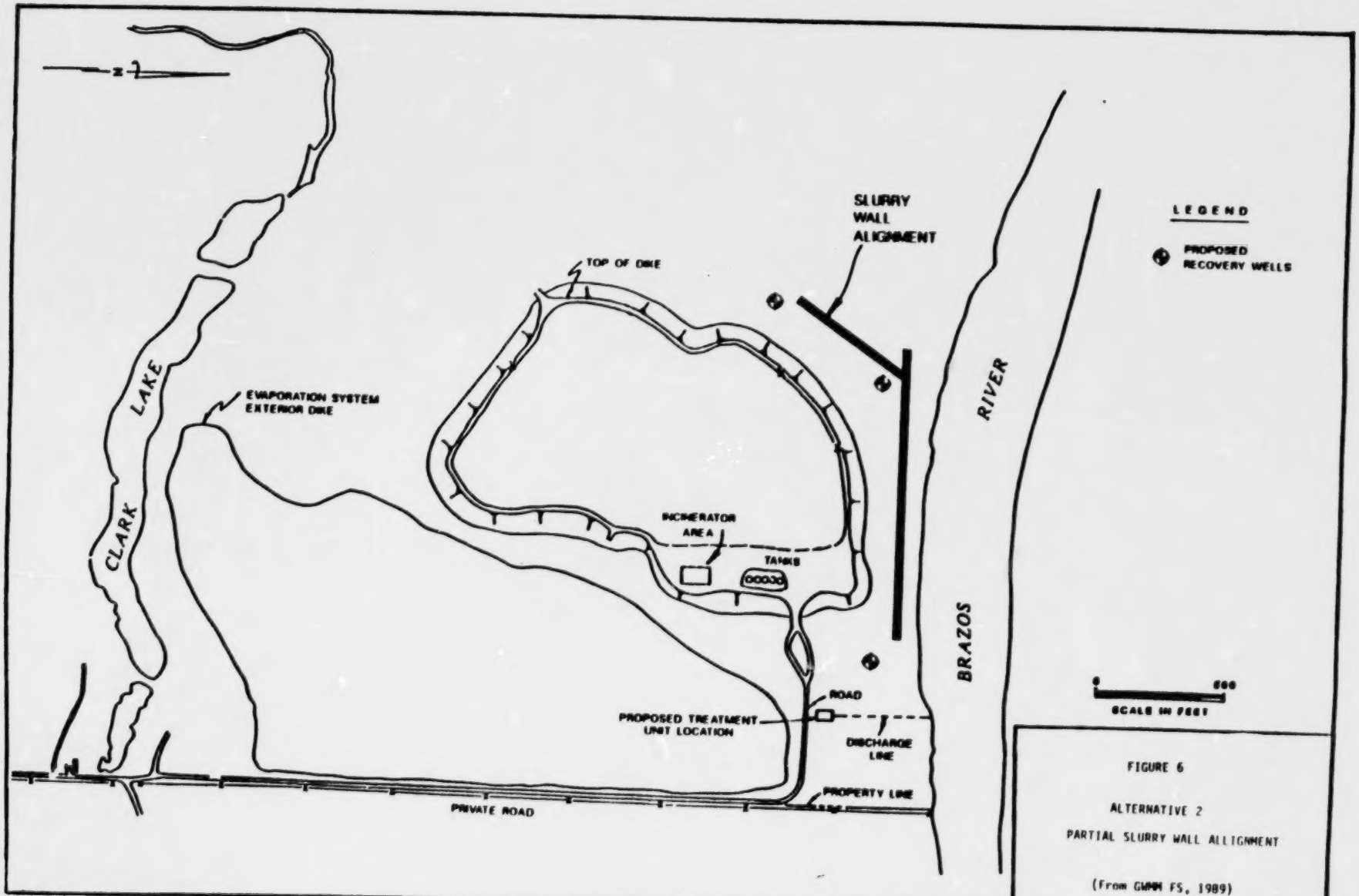

FIGURE 6

ALTERNATIVE 2

PARTIAL SLURRY WALL ALLIGNMENT

(From GMMH FS, 1989)

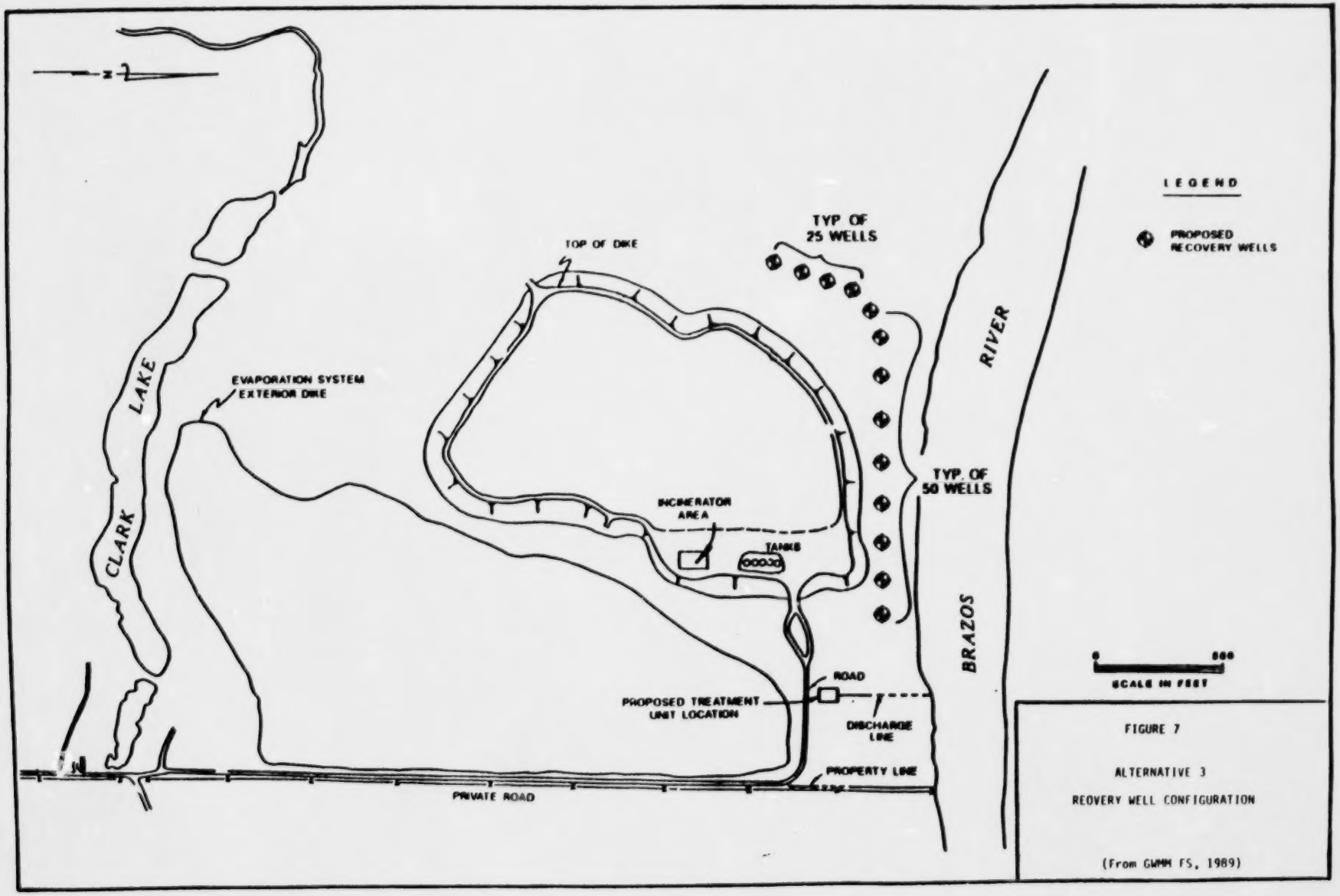

FIGURE 7

ALTERNATIVE 3

REOVERY WELL CONFIGURATION

(From GWMM FS, 1989)

The rationale for the ratings assigned each alternative is presented in the following subsections.

A. Compliance with Applicable or Relevant Appropriate Requirements (ARARs) of Other Laws

The No Action Alternative is accorded a rating of "-" due to the inability to monitor the ground water and determine whether ARARs are continuing to be met for the long term. The Alternatives 1, 2, and 3 all meet ARARs and are rated ".".

B. Reduction of Mobility, Toxicity and Volume

The processes of natural attenuation such as biodegradation, sorption and dispersion, may reduce the toxicity, mobility and volume of waste constituents For this reason, Alternatives 1 and 4 are ranked ".". The alternatives which involve ground water recovery (Alternatives 2 and 3) include ground water treatment and thus reduce the mobility, toxicity and volume of the ground water. These alternatives are given a rating of "+". However, it should be noted that at the design flow rate and composition of the treatment scheme proposed for Alternatives 2 and 3, less than eight pounds of total contaminants would be removed in the first year and this quantity would very likely decrease with time.

C. Long-Term Effectiveness and Permanence

The No Action alternative is ranked "-" due to the inability to monitor whether ARARs are continuing to be met or prevent the use of contaminated ground water for the long term. In the long-term, the concentrations of constituents will be reduced by natural processes, therefore Alternative 1 is accorded a ranking of ".". Alternatives 2 and 3 will be slightly more effective at reducing the concentrations of constituents in the long-term. Therefore, both 2 and 3 are rated "+".

D. Short-Term Effectiveness

The No Action alternative is ranked "-" due to the inability to prevent ground water use before attenuation takes place. The Natural Attenuation Alternative, for the short-term, is equally effective as Alternatives 2 and 3 since the institution of controls will prevent exposure to contaminated ground water. For this reason, Alternative 1 is ranked ".". However, alternatives 2 and 3 will cause onsite workers to be exposed to additional potential risk since these alternatives include active construction and operation activities. Therefore, Alternatives 2 and 3 are ranked "-".

E. Implementability

Alternative 1 and 4 would be the most easily implemented and are rated "+". Between the remaining alternatives, Alternative 3 is more easily implemented than 2. Alternative 3 is rated ".", since it requires construction of wells and a treatment plant. Alternative 2, partial slurry wall with ground water treatment, is rated "-" due to the difficulties in constructing a slurry wall considering the site constraints. Site constraints include a narrow strip of land for access, the fact that a trench of 65' depth is beyond the

reach of normal trenching equipment and a new working "bench" would need to be constructed.

F. Cost

Table 3 summarizes the cost of the alternatives as developed in detail in Section 6.3 and Appendix C of the feasibility study. Costs are presented as capital, operation and maintenance, present value and total cost. The No Action and Natural Attenuation alternatives (4 and 1) are the least costly alternat and are both ranked "+". Alternative 2 is intermediate in terms of cost and is rated ".". Alternative 3 is the most costly alternative and is therefore rated "-".

G. Overall Protection of Human Health and the Environment

The No Action alternative is ranked "-" due to the inability to prevent potential use of affected ground water and lack of monitoring. Alternative 1 is ranked "." since the seepage of ground water into the Brazos River under current and projected future conditions will result in concentration levels which are protective of human health and the environment. In addition, institutional controls would effectively prevent use of the affected ground water. Alternatives 2 and 3 are equivalent to Alternative 1 in terms of overall protection of human health and the environment and are therefore rated ".". The reasons for this ranking are discussed below:

The shallow ground water recovery rate is relatively low, therefore withdrawal of one pore volume of ground water will require about 25 years. Since extraction of multiple pore volumes would probably be necessary to achieve drinking water criteria (MCLs), it is anticipated that treatment would continue for some multiple of 25 years. During this relatively long time period, the shallow ground water would not meet drinking water criteria and could not be used as such. Institutional controls would be maintained for this period to prevent potable use of the shallow aquifer. Therefore, Alternatives 1, 2 and 3 all require long-term institutional controls to prevent use of the shallow aquifer.

H. Community Acceptance

The community has voiced limited support for the Natural Attenuation alternative and has not expressed any concerns about the alternative. Therefore natural attenuation is rated "+" and all other alternatives are rated ".".

I. State Acceptance

The State of Texas, through the Texas Water Commission, has indicated that they have no objection to the selected alternative. Therefore, Natural Attenuation is rated "+" and all remaining alternatives are rated "0".

J. Summary of Comparative Analysis

As described above, alternatives 1, 2 and 3 are fully protective of public health and the environment. All of the alternatives except No Action could also be implemented to comply with all ARARs. With regard to the balancing

TABLE 3

Alternative Costs (in thousands)

	Alternative	Capital Cost	Operation and Maintenance	Present Value Cost	Total Cost
1.	Natural Attenuation	-0-	$326	$194	$326
2.	Partial Slurry Wall with Ground Water Treatment	$850	$3,346	$2,428	$4,196
3.	Recovery Wells with Ground Water Treatment	$1,095	$4,234	$3,073	$5,329
4.	No Action	-0-	-0-	-0-	-0-

criteria, alternatives 2 and 3, make a slight reduction of toxicity of the affected ground water, but the reduction is very small, and the resulting decrease in surface water concentrations would not be detectable. Furthermore, these alternatives concentrate waste constituents on GAC, which must eventually be disposed of. The more costly alternatives (Alternatives 2 and 3), are generally more difficult to implement and may pose more short-term risks to onsite workers. Finally, Alternatives 2 and 3 will not appreciably decrease the time necessary to achieve MCLs.

VIII. SELECTED REMEDY

Based on the information provided in the administrative record and the results of the evaluation of alternatives (Section 5.3), the "final" remedy has been selected. It is EPA's judgement that Alternative 1, Natural Attenuation, best satisfies both the statutory and selection criteria in comparison to the other alternatives evaluated in this document. This remedy is consistent with the remedy selected for the Source Control operable unit.

8.1 DESCRIPTION OF SELECTED REMEDY

A. Establish Alternate Concentration Limits (ACLs) as the Ground Water Protection Standard

EPA has selected ACLs as the apprpriate ground water standard for the site as long as the conditions set forth below remain valid. ACLs are ground water protection standards that are used to assure that hazardous constituents found in the ground water do not pose a risk to human health or the environment. To ensure that ACLs remain protective, the following conditions must continue to be met at the site:

a. The Brazos River must remain the discharge point for ground water from the site.

b. The Brazos River cannot be adversely impacted by the discharge of contaminated ground water into the river. Presently, no adverse impacts to the river from the site have been observed. To ensure that future adverse impacts from the site do not occur at the point of exposure for environmental receptors in the river, river water will be sampled to ensure that there is no statistically significant increase in contamination, as compared to upgradient locations.

c. The ground water use restrictions outlined below must be implemented and continued to ensure that affected ground water is not consumed and the integrity of the Brazos River as a hydraulic barrier to ground water flow is maintained.

If any of these conditions change, the situation will be reevaluated and appropriate action taken. The specific provisions for setting the ACLs are outlined below.

ACL Contaminants and Concentrations

EPA has set ACLs for the contaminants detected in the ground water in order meet drinking water criteria in the Brazos river. These values were calculated by determining the volume of affected water entering the river at any time and factoring in the dilution which would occur in the river at historical low flow conditions.

These ACLs are listed below:

Compound	ACL (ppm)
Benzene	26
Tetrachloroethylene	41
Trans-1,2 dichloroethylene	26
Trichloroethylene	26
Arsenic	260

If additional contaminants are detected in the ground water in the future, ACLs will be developed for them using the methodology described in the F.S.

Point of Compliance

The point of compliance is the location where ACLs must be met and is also the well location where ACLs are monitored. At the point of compliance, ACLs will be met at concentrations that ensure that human health and the environment are protected at the point of exposure and that no statistically significant increase in contamination occurs in the river.

The specific locations for the point of compliance monitoring, based on the existing position of the ground water plume, are around the boundary of the lagoon and are designated as well numbers 34 and 35 as illustrated in Figure 8. If the plume position changes additional compliance points may be identified.

Point of Exposure

A point of exposure is a location where environmental or human receptors may be exposed to or use ground water. Exposure to ground water at that point cannot result in an endangerment to human health or the environment. At the Sheridan site, the point of exposure will be the interface of ground water and the Brazos River (i.e., where offered ground water comes into contact with the river). It will be monitored by the collection of water samples from the Brazos River at the projected point, or points of entry of affected ground water from the site.

Ground Water Use Restrictions

Ground water use at the site will be restricted to ensure that contaminated ground water is not consumed and that the hydraulic barrier that the Brazos River provides is not affected. Ground water use onsite will be restricted within a minimum of 100 feet from the edge of the plume of contaminated ground water. In addition, the use of any well (other than that employed as part of a corrective action) which could potentially affect the size or position of the plume of ground water contamination is prohibited.

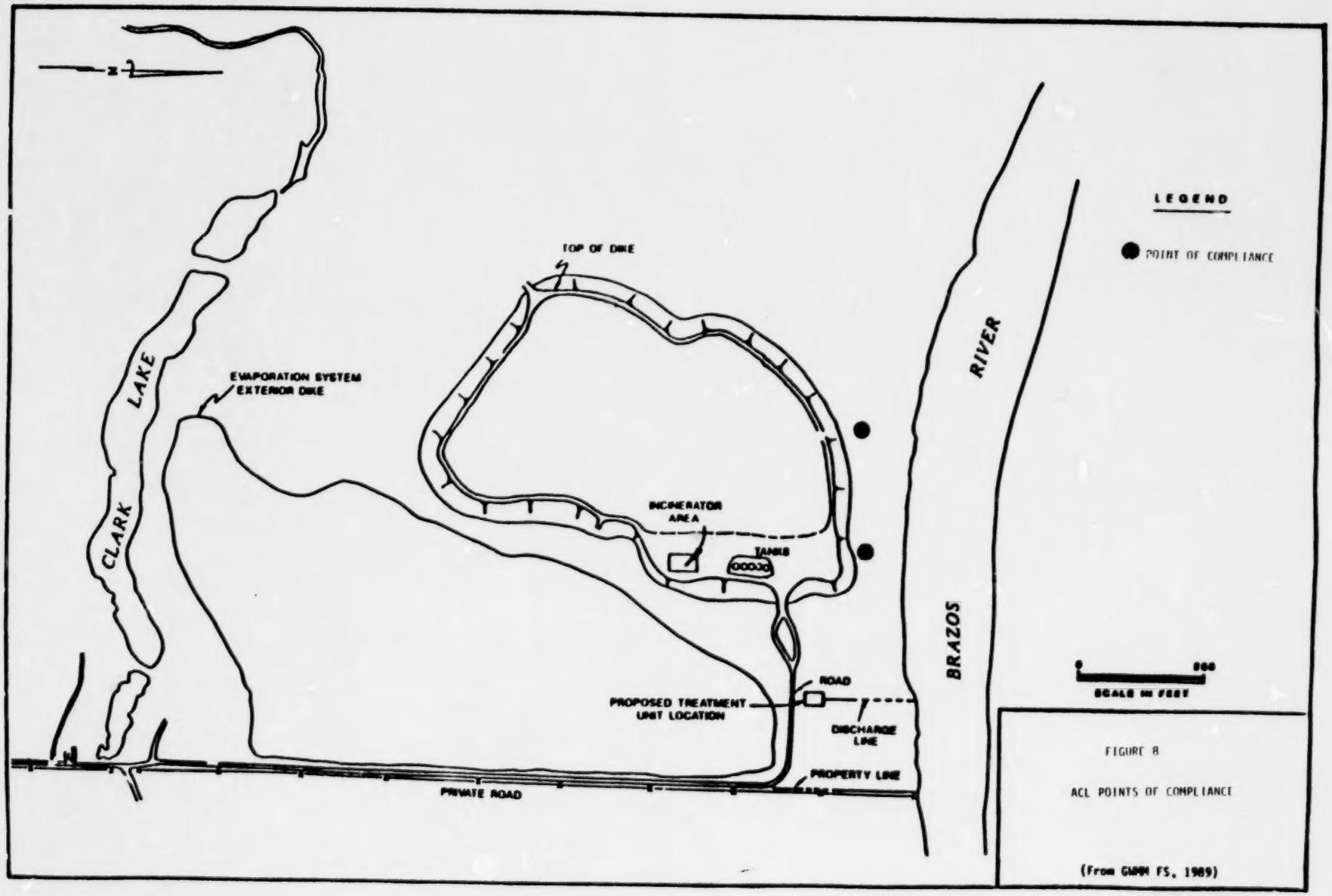

FIGURE 8

ACL POINTS OF COMPLIANCE

(From GUMM FS, 1989)

The ground water use restrictions which will be implemented are deed notices recorded in the county clerks office. These restrictions are expected to be reliable and effective for the following reasons.

1. The area of attainment (ground water contamination plume exclusive of the area beneath the lagoon) is limited to a narrow strip of land between the waste lagoon and the river, and is located entirely onsite, on the land owner/former operator's property.

2. The yield of the aquifer is too low to be of agricultural use, which is the most likely potential use.

3. The land owner/former operator is a signatory to a proposed Consent Decree which states that he will not take any actions at the site without getting prior written Consent from EPA. In addition, the terms of any sale of the site property must contain a provision requiring compliance with the consent decree.

4. There will be, at the minimum, annual monitoring of site conditions to verify that the restrictions are effective.

EPA has enforcement authority to ensure that the remedy selections for the source control and GWMM operable units are implemented and that no one interferes with remedy implementation. If any of the conditions listed above should change, the existing situation will be evaluated and appropriate action will be taken to prevent potential use of contaminated ground water.

Ground Water Monitoring

Ground water will be monitored to ensure compliance with ACLs and the three conditions listed at the beginning of Section 8.1. Compliance monitoring will be conducted quarterly for the first year. The frequency of monitoring may then be modified by EPA.

The first time an ACL for a particular contaminant is exceeded, the well will be resampled. If the second analysis confirms that the ACLs are being exceeded, EPA will determine whether the corrective action program outlined below will be implemented.

Finally, additional wells will be monitored quarterly to ensure that the Brazos River continues to act as a discharge point and hydrological barrier to ground water flow. The monitoring frequency of these wells may be modified by EPA.

Surface Water Monitoring

The surface water from the Brazos River will be monitored to ensure that there is no statistically significant increase in contamination due to the ground water recharge to the River. Samples will be obtained in the river immediately adjacent of the point of projected entry of effected ground water and upgradient of the site.

B. Corrective Action and Contingency Planning

In the event ACLs are exceeded, if any of the three conditions outlined at the beginning of section 8.1.A. are not met, or if changes in receptors

40 C.F.R. §264.100 will be implemented. As part of the design of the remedial action, a corrective action contingency plan will be developed. Under the corrective action program, contaminated ground water will be extracted and treated, or other necessary and appropriate action will be undertaken, to reduce contaminant levels to ensure that ACLs are not exceeded at the compliance point and that the remedy is protective of human health and the environment at the point of exposure.

If ground water needs to be treated at the site, different process options, including a combination of treatment technologies, will be considered during the design of the treatment system. The process presented in the FS for the pump and treat alternatives is one possible process configuration that could be utilized. During design of the treatment system, the particular tecology or technologies will be chosen on the basis of performance goals that EPA sets for the treatment system.

C. Monitoring, Operation and Maintenance (MOM)

1. The site will be secured to meet the requirements of 40 C.F.R. §264.14 during post-closure.

2. The ground water monitoring system will be monitored and maintained to comply with the requirements of 40 C.F.R. Part 264, Subpart F.

3. A written MOM plan will be developed to define the activities which will be necessary to ensure the remedy will continue to be effective.

Additionally, because hazardous substances will remain on-site, EPA will re-evaluate this site at least once every five years after the commencement of the remedial action to assure that human health and the environment continue to be protected.

8.2. RATIONALE FOR SELECTION OF THE REMEDY

In accordance with Section 121 of CERCLA, to be considered as a candidate for selection, an alternative must be protective of human health and the environment and attain ARARs. For ground water, attainment of ARARs requires that a ground water protection standard be set at either Maximum Contaminant Levels (MCLs), ACLs or at background levels. To meet the ground water protection standards, both pump and treat and natural attenuation alternatives were evaluated.

Because Alternative #4, No-action, is not protective and does not attain ARARs, it was rejected from further consideration.

The remaining three alternatives, which utilize natural attenuation or ground water recovery and treatment, all meet the statutory threshold criteria of protectiveness and attainment of ARARs. To select among them, EPA focused on other criteria, including: short-term effectiveness, long-term effectiveness, implementability, reduction of mobility, toxicity or volume of waste, community acceptance and State acceptance.

The advantages of the ground water recovery and treatment alternatives is that they will achieve safe levels more quickly and utilize treatment to permanently

reduce the toxicity of contaminants. However, the magnitude of these potential benefits is quite small; the cleanup timeframes are estimated to be about 10-15% (i.e., 75 vs. 90 years) faster than for natural attenuation, and a maximum of eight pounds per year of total contaminants will be treated annually by sorption onto GAC.

The first disadvantage of the ground water recovery and treatment alternatives (Alternatives 2 and 3) is that their operation and maintenance poses greater potential short-term risk to on-site workers during construction and operation of the extraction and treatment systems. Second, Alternative 3 (recovery wells), and to an even greater extent alternative 2 (partial slurry wall), are more difficult to implement than natural attenuation. Third, the costs of alternatives 2 and 3 are between ten and twenty times greater than the costs of natural attenuation. Finally, the State and the community have expressed limited support of the natural attenuation alternative. In light of these considerations, EPA has determined that Alternative 1, Natural Attenuation, best satisfies the nine criteria for remedy selection.

As discussed in the description of the Selected Remedy, the natural attenuation alternative requires the implementation and enforcement of ACLs as the appropriate ground water protection standard for ground water in the area of attainment. The rationale for selection of this standard is described in the paragraphs which follow.

Under RCRA regulations, the ground water protection standard establishes a safe level of contamination in ground water in the vicinity of a waste disposal site. Under these regulations, the protection standard can be set at MCLs, ACLs, or at background levels. ACLs are based on the premise that, although ground water is contaminated around a waste disposal site, at a point where a potential receptor may come into contact with ground water, levels of contaminants are not found at unsafe levels. At locations where exposure to ground water may not be safe, enforceable controls to prevent exposure may be implemented. At the Sheridan site, that basic premise is satisfied. Ground water around the site is contaminated, however, the river and other site features contain and attenuate contamination in the ground water to protective levels and enforceable controls can be implemented.

In addition to the RCRA requirements, under Section 121(d)(2)(B)(ii) of CERCLA, 42 U.S.C. §9612(d)(2)(ii), EPA may not establish ACLs as the ground water protection standard for a Superfund site if human exposure to hazardous constituents will occur beyond the site boundary (as that boundary is defined in the RI/FS), unless EPA had determined that:

a. there are known or projected points where the ground water will enter into the surface water;

b. there is or will be no statistically significant increase in the level of hazardous constituents in the surface water at the points of entry of contaminated ground water into the river.

c. the remedial action includes enforceable remedial measures to preclude human exposure to ground water between the site boundary and all known or projected points of entry.

The RCRA requirements and the CERCLA prerequisites for an ACL are met at the Sheridan site because of the following reasons:

1. The ground water characterization study completed in the RI concluded the Brazos River is a hydraulic barrier. Contaminated ground water from the site discharges into the river. Thus, there are known or projected points where site ground water will enter into the river.

2. Sampling and analysis conducted by EPA indicates that the Brazos River acts as a hydrologic barrier that will tend to dilute and disperse contaminants. Sampling also indicates that there is no statistically significant increase in hazardous constituents in the river which can be attributed to the site.

3. Ground water that is contaminated by the site is not currently used as a source of drinking water. Deed recording, when applied in conjunction with the assumptions described in Subsection 6.1.A., will be used to ensure that contaminated ground water is not consumed.

4. Because the impermeable cap required by the Source Control ROD will prevent infiltration of rainwater into the waste lagoon, flushing of lagoon contaminants into ground water will be significantly decreased in the long-term.

5. The setting of ACLs for individual contaminants at the points of compliance will ensure that human and environmental receptors are not exposed to unsafe levels of contaminants at the points of exposure. In the event an ACL for an individual contaminant is exceeded, corrective action at the site will be implemented consistent with Section 6.1. Thus, setting ACLs provides EPA with an enforceable mechanism that sets into motion corrective action.

ACLs will be effective and protective of human health and the environment in the long-term. Although the development of ACLs as the ground water protection standard will not reduce contaminants in ground water, their enforcement will ensure protection of public health and the environment at each and every point of exposure. Further, the corrective action program will ensure that the remedy continues to be effective.

Alternatives 2 and 3 which call for pumping and treating ground water, are no more protective than the selected remedy because they will still require the implementation of controls to prevent the use of ground water until safe levels are met. Furthermore, site conditions may prevent the attainment of MCLs within a reasonable timeframe. These conditions include 1) the potential for continued leaching of contaminants sorbed to the aquifer (particularly clay layers) 2) the low hydraulic gradient across the site and the potential that capping the lagoon area as required by the Source Control ROD may further reduce these gradients, and 3) the low yield and small radii of influence of pumping wells in the affected aquifer. In view of these conditions, EPA has determined that cleanup to MCLs is not practicable. Therefore, the development and enforcement of ACLs is necessary. However, pumping and treating ground water may be implemented under the corrective action plan to ensure that ACLs are not exceeded.

IX. STATUTORY DETERMINATIONS

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions which are protective of human health and the

environment. In addition, Section 121 of CERCLA established several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element.

9.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy protects human health and the environment through the implementation of ground water use restrictions on-site and the enforcement of ACLs to ensure safe levels are maintained at the first point of potential exposure in the Brazos River. The implementation of the selected remedy will effectively reduce any potential excess cancer risk associated with ingestion of contaminated ground water.

9.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

The selected remedy will attain all applicable or relevant and appropriate federal and state environmental requirements at the site. Federal environmental laws that are applicable or relevant and appropriate to the selected remedial action at the site include the:

- Resource Conservation and Recovery Act (RCRA);
- Clean Water Act (CWA);
- Safe Drinking Water Act (SDWA); and
- Executive Order 11988 (Floodplain Management)

State environmental laws that are applicable or relevant and appropriate to the selected remedial action at the site are:

- Texas Clean Air Act; and
- Texas Administrative Code Relating to State Water Quality Standard

A discussion of how the selected remedy meets those requirements follows.

Ground Water

RCRA ground water protection standards (GWPS), 40 C.F.R. Part 264, Subpart F, are established for constituents entering ground water from a regulated hazardous waste unit. Although RCRA is not applicable to the Sheridan site, the waste lagoon presents problems that are similar to those that the requirements address, and thus, the requirements are relevant and appropriate. Ground water protection standards under the RCRA regulations are set at MCLs, ACLs, or at background levels. Because the Brazos River acts as a hydrologic barrier for site ground water, EPA has determined that ACLs are the relevant and appropriate standards at the site. If hydrogeologic conditions at the site change significantly and contaminated ground water was to no longer discharge to the Brazos then MCLs, promulgated pursuant to the Safe Drinking Water Act, are ARARs. These standards

are relevant and appropriate for ground water at the point where exposure to ground water may occur.

Surface Water

The reach of the Brazos River adjacent to the site is classified by the State as suitable for public water supply and recreational use. Therefore, MCLs and State and Federal Water Quality Criteria promulgated pursuant to the Clean Water Act are relevant and appropriate in the Brazos River. Further, all actions will meet the applicable requirements of 31 Texas Administrative Code Sections 329, 21-29, 307.1 to 307.10. Finally, if corrective action is required, all discharges will be treated to satisfy the requirements of the Clean Water Act application of best available technology (BAT) and best conventional technology (BCT).

Air

If a corrective action is required, the treatment facility will be designed to meet the requirements of Section 4.01 of the Texas Clean Air Act.

Post-Closure Care

Monitoring of ground water will be conducted in accordance with the relevant and appropriate RCRA ground water monitoring requirements under 40 CFR Part 264, Subpart F. In addition, site reviews will be conducted at least once every five years to ensure that the remedy is continuing to be protective of human health and the environment.

Corrective Action and Contingency Planning

If a ground water corrective action becomes necessary then these activities will be conducted in accordance with the corrective action regulations 40 CFR Section 264.100. Such action will also be conducted in accordance with any relevant and appropriate requirements of the general facility standards in 40 CFR part 264, Subpart B.

9.3 COST-EFFECTIVENESS

The selected remedy is cost-effective because it has been determined to provide overall effectiveness proportional to its costs, the net present worth value being $194,000. It is the least costly alternative which is fully protective of human health and the environment and attains ARARs.

9.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT PRACTICABLE

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the GWMM operable unit at the site. Of those alternatives that are protective of human health and the environment and comply with ARAPs, EPA has determined that the natural attenuation alternative provides the best balance of tradeoffs in terms of balancing and modifying criteria for remedy selection. As described in section 6.2, it is not practicable to treat ground

water because pumping and treating the ground water will not appreciably decrease the cleanup timeframes compared to natural attenuation. Further, attaining drinking water standards in, for example, 75 years, is highly unlikely due to site-specific hydrogeological conditions which include low ground water flow velocities and the presence of numerous clay strata which may act as a continuing source of contaminants to ground water.

9.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The operable unit does not utilize treatment to address the principal threat posed by the contaminated water because the implementation of treatment alternatives was found to not be practicable, due to site-specific constraints. However, the Source Control ROD utilizes treatment to address contaminated soils and sludges which act as a source of contaminants to ground water. The quantity of contaminants which could potentially be treated in ground water (a maximum of 8 pounds per year) is very small when compared to approximately 500,000 pounds of contaminants which will be treated as part of the source control remedy.

X. DOCUMENTATION OF NO SIGNIFICANT CHANGES

EPA issued a Proposed Plan (preferred alternative) for remediation of the site on July 31, 1989. The selected remedy does not differ from the Proposed Plan.

(Available upon request)

APPENDIX A

ADMINISTRATIVE RECORD INDEX

FINAL

SITE NAME: SHERIDAN DISPOSAL SERVICE

SITE NUMBER: TXD 062132147

INDEX DATE: 09/29/89

APPENDIX B

SHERIDAN DISPOSAL SERVICES
COMMUNITY RELATIONS RESPONSIVENESS SUMMARY

This Community Relations Responsiveness Summary has been prepared to provide written responses to comments submitted regarding the proposed plan of action for the ground water portion of the Sheridan Disposal Services hazardous waste site. The Summary is divided into two sections:

Section I. Background of Community Involvement and Concerns. This section provides a brief history of community interest and concerns raised during the remedial planning activities at the Sheridan site.

Section II. Summary of Major Comments Received. Any written or oral comments are summarized and EPA's responses are provided.

I. Background

In general, there has been a long history of citizen awareness of the Sheridan Disposal Services site. In the early 1970s when incineration at the site resulted in air emissions, people living within a 7-mile radius complained. In 1971 a citizens' group submitted a petition with over 500 signatures to the Texas Water Quality Board calling for its closure. However, community concerns of either the area residents or local officials are now very low, probably because the site has been inactive since 1984. Also the site is relatively remote and there are no residences within a mile.

II. Summary of Major Comments Received

The proposed plan fact sheet announcing the public comment period and opportunity for a public meeting for the ground water portion of the site was distributed on July 31, 1989. The comment period began on August 14, 1989 and ended on September 11, 1989. No one responded to the offer of a public meeting and none was held. No written comments or questions were received by EPA.

APPENDIX C

Garcia
Tipple
Feeley
Ferguson
Eden
Beinke
1400GG04.LTR

September 22, 1989

Allyn M. Davis, Ph.D., Director
Hazardous Waste Management Division
U.S. Environmental Protection Agency
Region VI
1445 Ross Avenue
Dallas, Texas 75202-2733

Re: Sheridan Disposal Service Superfund Site
Draft Record of Decision
Ground Water Migration Management Operable Unit

Dear Dr. Davis:

We have reviewed the proposed Record of Decision (ROD) for the Sheridan Disposal Service Superfund site. We have no objection to the selected remedy for the Ground Water Migration Management Operable Unit as described in the draft ROD of September 15, 1989. The selected remedy described as the natural attenuation alternative requires the establishment of Alternate Concentration Limits (ACLs), ground water monitoring, sampling and analysis of the Brazos River, implementation of controls to preclude the use of contaminated ground water, and implementation of a corrective action plan in the event that ACLs are exceeded at some time in the future.

Sincerely,

Allen Beinke
Executive Director

RECORD OF DECISION

FOR

SHERIDAN DISPOSAL SERVICES SITE

WALLER COUNTY, TEXAS

(SOURCE CONTROL OPERABLE UNIT)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DECEMBER 1988

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1445 ROSS AVENUE SUITE 1200
DALLAS, TEXAS 75202

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Sheridan Disposal Services site, Waller County, Texas

STATEMENT OF PURPOSE

This decision document outlines the selected remedial action for the Sheridan Disposal Services site in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, November 20, 1985.

This decision document describes the remedial action for the Source Control Operable unit. This first operable unit reduces the risks associated with exposure to contaminated materials and addresses the sources of contamination to ground water by treating onsite wastes and soils. The second operable unit will address ground water.

The State of Texas (through the Texas Water Commission) has been provided an opportunity to comment on the technology and degree of treatment proposed by the Record of Decision. The letter describing the State's concurrence with the selected remedy is found in Appendix D.

STATEMENT OF BASIS

This decision is based on the administrative record for the Sheridan site. The index found in Appendix B identifies the items which comprise this administrative record.

DESCRIPTION OF THE REMEDY

Upon review of the information contained in the administrative record, it is EPA's judgment that onsite biotreatment of wastes appears to best serve both statutory and selection criteria in relation to the other solutions evaluated. A detailed description of this remedy and an explanation of how it meets statutory requirements is contained in the attached "Summary of Remedial Alternative Selection."

Waste requiring remediation by Biotreatment shall be defined by the following:

1. All material containing greater than 25 ppm of PCBs. This material includes the sludges contained in the pond and evaporation system;

2. Floating oil and emulsion in the pond and in onsite storage tanks;

3. Affected soil under pond - Affected soil under the pond is defined as soil that is intermixed with sludge or contains greater than 25 ppm of PCBs. The extent of affected soil under the pond will be determined during the remedial design/remedial action.

4. Dike surface soils - This material shall include: 1) oily soil on the inside dike slope between the current sludge level to the highest level the floating oil layer has contacted; 2) Grossly contaminated soil and sludge deposits visible on the dike. At a minimum, this shall include the soil and sludge in the vicinity of the treatment tanks and incinerator in the north-northeastern portions of the dike.

5. The wastes described in items 1-4 above address all wastes containing over 25 ppm of PCBs and/or high concentrations of other organics such as benzene and phenol.

If Biotreatment can reduce the level of PCBs in the residuals to less than 50 ppm, the residuals will be stabilized, returned to the pond and capped. If the concentration of PCBs in the biotreated residuals is greater than 50 ppm, they will be stabilized and returned to a RCRA-compliant landfill in the pond area.

In addition to treating the waste described above by Biotreatment the remedy shall also include the implementation of the actions described below:

- o Install a RCRA-compliant cap over the entire pond and dike area.

- o Install a flexible spur jetty river bank erosion control system in the Brazos River.

- o Monitor ground water quality for a minimum of 30 years.

- o Decontaminate, disassemble and properly dispose of all onsite tanks and processing equipment.

- o Properly dispose of any drums encountered during remediation. Contents of intact drums will be treated onsite or disposed of offsite, depending on the nature of the material.

- o Treat potentially contaminated stormwater and waste-water streams resulting from the waste treatment alternatives, to remove solids, metal, and organic constituents. The treated water will comply with all Federal/State standards for discharge into the Brazos River.

- Implement institutional controls to preclude use of contaminated ground water and ensure the long-term integrity of the cap.

DECLARATION

The remedy described above is protective of human health and the environment, attains Federal and State applicable or relevant and appropriate requirements and is cost-effective. This remedy satisfies the statuatory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element and utilizes permanent solutions and alternative technologies to the maximum extent practicable.

Because this remedy may result in hazardous substances remaining onsite above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Date

Robert E. Layton Jr., P.E.,
Regional Administrator

SHERIDAN DISPOSAL SERVICES SITE

WALLER COUNTY, TEXAS

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

DECEMBER 1988

TABLE OF CONTENTS

		PAGE
I	SITE LOCATION AND HISTORY	1
	1.1 History and Enforcement	1
	1.2 Geology	2
	1.3 Hydrogeology	2
	1.4 Site Investigation Results	3
	1.5 Treatability Testing	5
	1.6 Potential Impacts of the Site on Human Health and the Environment	6
II	ENFORCEMENT	7
III	COMMUNITY RELATIONS	7
IV	ALTERNATIVE EVALUATION	8
	4.1 Evaluation Criteria	8
	4.2 Description of Alternatives	11
	4.3 Evaluation of Alternatives	12
	4.4 Operation and Maintenance	16
V	SELECTED REMEDY	16
VI	APPENDICES	
	A. Applicable, or Relevant and Appropriate Requirements Summary	
	B. Administrative Record	
	C. Responsiveness Summary	
	D. State Response to Record of Decision	

LIST OF TABLES

TABLE NUMBER	TITLE
1	Geologic Description and Water-bearing Properties of the Geologic Units forming the Aquifers in Waller and Austin Counties
2a	Summary of Organic Compounds detected On-site
2b	Summary of Inorganic Compounds detected On-site
3a	Results of Priority Pollutant GC/MS Analyses for for the Source Control RI
3b	Results of Priority Pollutant Sampling, October 1987 for Well Screened in the Unconfined Aquifer
4	Cost Summary of Remedial Alternatives

LIST OF FIGURES

FIGURE NUMBER	TITLE
1	General Site Location Map
2	Site Location Map
3	Site Plot Plan
4	General Schematic of Site Geology

I. SITE LOCATION AND DESCRIPTION

The Sheridan Disposal Services site is located approximately nine miles north-northwest of the City of Hempstead in Waller County, Texas. The site covers about 110 acres in a 700-acre tract of land which is bordered by the Brazos River to the north and Clark Road to the South (See Figures 1 and 2).

Located at the site are a lagoon (12-22 acres depending on water levels), a 17-acre dike surrounding the lagoon, and a 42-acre evaporation/land irrigation system. An incinerator and a group of nine storage tanks which were used for waste storage and treatment are located on the lagoon dikes. These site features are illustrated in Figure 3.

The predominant land-use within a four-mile radius of the site is agriculture and range land. The only primarily residential area within this four-mile radius is the community of Brown College. This community is made up of approximately 20 residences and is located one and one half miles north of the site. Nearby communities primarily utilize ground water from the Evangeline aquifer to meet their water supply needs.

The site is relatively flat, but slopes gently to the south. It lies within the 100-year floodplain of the Brazos River. However, the lagoon dikes have been built up to an elevation above that of the floodplain.

1.1 SITE HISTORY AND ENFORCEMENT

Sheridan Disposal Services operated as a commercial waste disposal facility form about 1958 to 1984. A wide variety of organic and inorganic chemical and solid wastes were disposed of at the site. The facility treated waste by steam distillation, open burning and incineration. The lagoon was developed in a low-lying area of the site and was used as a holding pond, and for the disposal of overflow wastes and waste treatment residues. In 1976, the facility initiated use of the evaporation system for disposal of water which accumulated on the lagoon.

The site's regulatory history began in 1963 when the Texas Water Quality Board (now known as the Texas Water Commission) issued a permit authorizing disposal of industrial solid waste. After permitting, the Texas Water Quality Board (TWQB) received complaints concerning odor, runoff and oil in the Brazos River. The State also noted increased concentrations of contaminants in on-site monitoring wells.

In 1970, the TWQB and Waller County filed suit against the Sheridan facility. After a series of meetings and public hearings, in 1975, a judgement was entered by the Court which prohibited further discharge of wastes into the lagoon. The TWQB and Sheridan Disposal Services discussed numerous closure plans for the lagoon until the TWQB determined that the facility did not have the economic or technical resources necessary to close the lagoon properly. In 1984, the Texas Department of Water Resources (successor of the TWQB) sent letters to generators and transporters of waste managed at the site to notify them of their potential liability under CERCLA.

FIGURE I
SITE LOCATION MAP
SHERIDAN DISPOSAL SERVICE

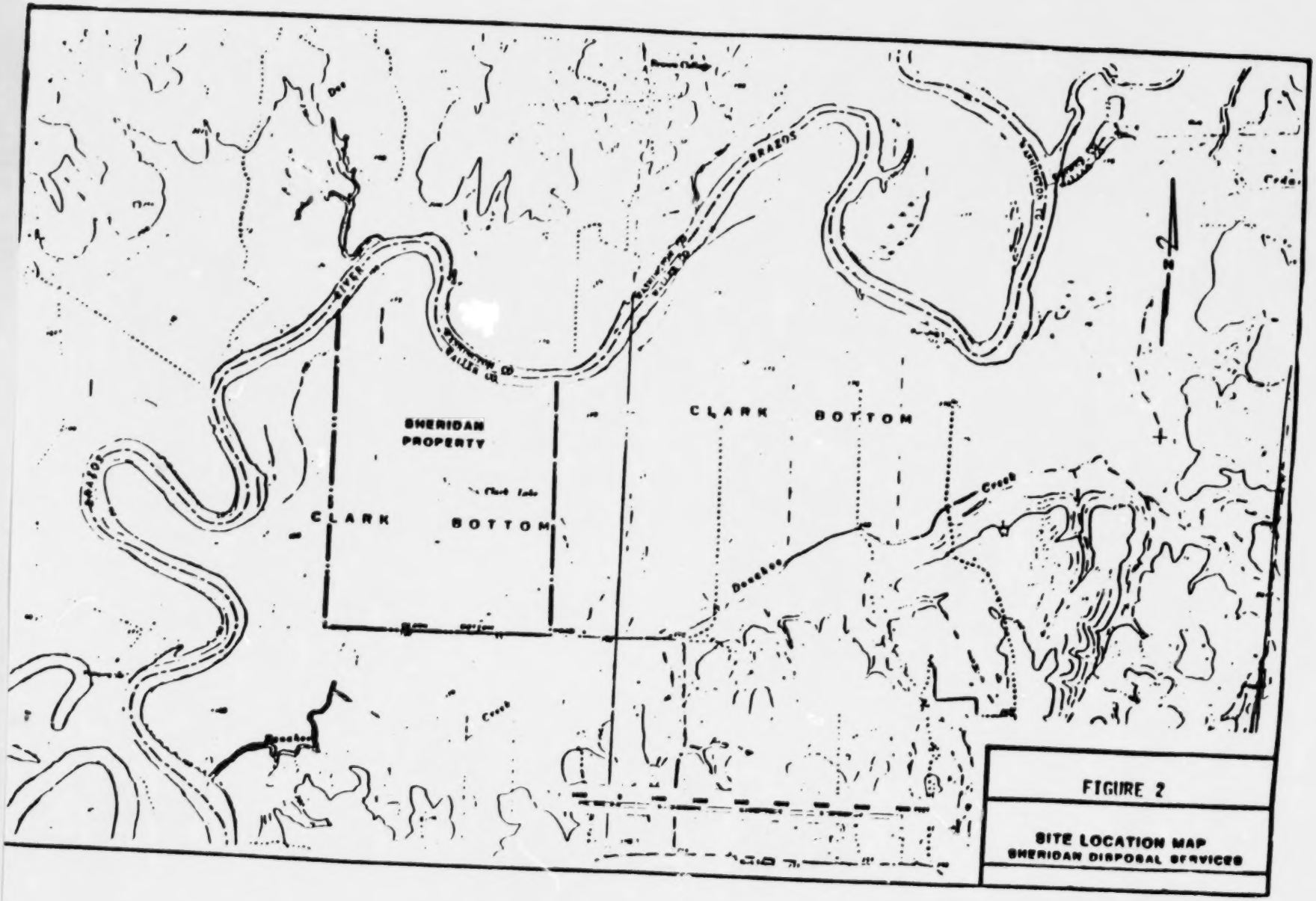

FIGURE 2

SITE LOCATION MAP
SHERIDAN DISPOSAL SERVICES

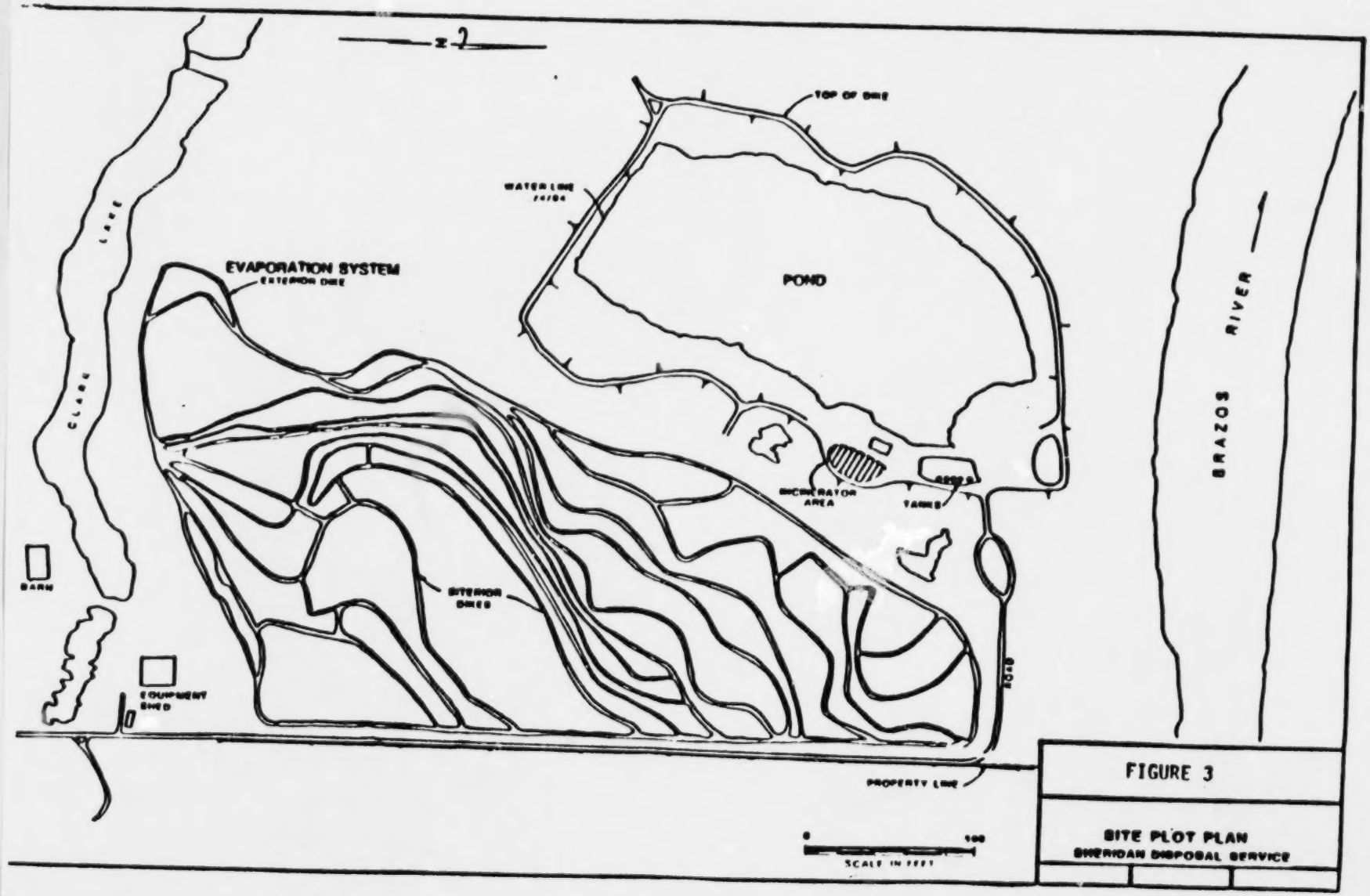

FIGURE 3

SITE PLOT PLAN
SHERIDAN DISPOSAL SERVICE

In response to this notification, the Sheridan Steering Committee, which is now known as the Sheridan Site Committee, organized and began to investigate the extent of contamination at the site. After polychlorinated biphenyls (PCBs) were identified in the lagoon, EPA became directly involved in site closure through the Toxic Substances Control Act (TSCA). The site was ranked according to the Superfund Hazard Ranking System and on June 10, 1986, the site was proposed for inclusion on the National Priorities List.

In June and July of 1986, 102 Notice/Information request letters were sent to site Potentially Responsible Parties (PRPs). During this time, the Sheridan Site Committee submitted a Remedial Investigation to EPA for evaluation. After reviewing this document the Agency determined that additional field investigations would be necessary to obtain adequate information on which to base a ground water remedy decision. However, in order to expedite lagoon cleanup and reduce further leaching into ground water, the site was divided into two operable units, a Source Control unit which is addressed in this ROD and a Ground Water Migration Management (GWMM) unit which will be addressed in a later ROD.

On February 3, 1987, 59 companies who were members of the Sheridan Site Committee entered into an Administrative Order on Consent with EPA to complete both the Source Control and GWMM RI/FSs. In 1988, EPA issued a unilateral order to site PRPs to lower the level of water in the lagoon. This action was implemented by the Committee's contractor with EPA oversight.

1.2 GEOLOGY

The Sheridan site lies on the Brazos River Alluvium of recent age, which is comprised of gravel, sand, silt and clay deposited by the meandering river. The Brazos River Alluvium unconformably overlies the Miocene-aged Fleming formation. The Fleming is made up of interbedded sand and clay layers. Table 1 provides a general description of the hydrogeologic units present in Waller and Austin counties. Please note that all formations from the Goliad sand to the Beaumont clay are not present beneath the site.

According to the Austin sheet of the Geologic Atlas of Texas, no faults with surface expression occur in the vicinity of the site. Field investigations conducted by the responsible parties' contractor verified this conclusion. The Hockley escarpment and Salt Dome are found about 18 miles south of the site and the Millican fault zone lies approximately 20 miles to the north. However, there is no evidence that these features influence the hydrogeology of the site.

1.3 HYDROGEOLOGY

The alluvium of the Brazos River forms the first Regional aquifer beneath the site. The Evangeline and Jasper aquifers underlie the alluvium. Most wells in the vicinity of the site tap the Evangeline aquifer, which is about 450 feet thick beneath the site.

Reproduced from best available copy.

Table 1

Geologic description and water-bearing properties of the geologic units forming the aquifers in Austin and Waller Counties

Aquifer	Stratigraphic unit	Estimated thickness in area (feet)	General composition in Austin and Waller Counties	Surface expressions	Water-bearing properties in Austin and Waller Counties
Alluvial	Tributary alluvium and flood-plain alluvium of the Brazos River	0- 80	Unconsolidated gray, brown, and reddish-brown clay, silt, and sandy clay, commonly overlying light-colored sand or coarser-grained sand and gravel.	Occurs along the banks of smaller streams and in the flood plain of the Brazos River. Nearly flat plain. Forms reddish to dark-brown and black soils.	Yields small to large amounts of fresh water in the flood plain of the Brazos River.
Evangeline	Beaumont Clay	0- 75	Mottled red, reddish-brown, brown and gray, dense clay with white calcareous nodules. May contain lenses of fine and medium-grained sand or sand and gravel in places.	Occurs only along the fringes of the Brazos River flood plain. Forms nearly flat, narrow plain. Soils are gray to black, heavy.	Yields small to moderate amounts of water to scattered shallow wells less than 100 feet deep along the edge of the Brazos River flood plain.
	Montgomery Formation	0- 40?	Light gray to light brown, fine-grained sand, silt, and clay, probably grading with depth to darker-colored coarser sand and in places basal sand and gravel.	Nearly flat, featureless plain; soils are light colored, fine-grained sandy. Occurs only along southern edge of area.	Yields small amounts of water to scattered shallow wells.
	Bentley Formation	0- 30?	Alternating beds of reddish-brown to yellow and gray, mottled clay interbedded with grayish, fine- to coarse-grained sand and gravel lenses. Scattered lentils of lime-cemented sandstone. Clay, sandy clay, and fine sand predominate in the upper part, darker-colored coarser sand and gravel in the lower part.	Forms flat plains in the southern one-third of the counties; most of the rice-growing area is on the outcrop. Forms light-colored sandy loam soils.	Contributes small to moderate amounts of fresh water to domestic wells in the southern part of the area; probably represented by the upper sand screened in these wells.
	Willis Sand	0- 240?	Alternating beds of mottled red, yellow, brown, and gray clay and sand with scattered lenses unsorted sand and quartz gravel. Ferruginous nodules common. Packed and hard in fresh exposures. Basal part is usually a hard, gravelly sand and clay.	Forms the gently-rolling sand hills of northern Waller County and central Austin County. Most of the gravel pits in Austin County are in the basal Willis. Forms tan sandy soils.	Yields small to large amounts of fresh water to wells.
	Goliad Sand	0- 240?	White to gray, sticky, calcareous clay with interbedded lenses of light-colored, gravelly sand and lime-cemented sandstone. Black chert grains in the whitish sand give a salt and pepper effect.	Occurs as isolated surface exposures because the Goliad is overlapped by the Willis Sand or is easily removed by erosion. Forms gray, sticky soils. Usually occurs along valley bottoms and walls.	Yields large amounts of fresh water to wells.
	Fleming Formation	0-1,700	Interbedded clay and sand; clay predominantly in the upper part. The blocky, dense clay is various shades of gray, yellow, olive, and brown. White calcareous nodules are common. Sand is gray to brown, brown, interbedded with gray clay. Sand is medium to fine grained and often cross-bedded.	Forms the rolling and dissected topography of northern Austin County. Forms gray to black loam and sandy loam soils.	Yields small to large amounts of fresh to slightly saline water.
Burkeville Aquiclude					
Jasper	Catahoula Sandstone	?	Alternating beds of gray clay, tuff, and sand. Lower sands may be hard, white, and have opaline appearance.	Does not crop out in Austin or Waller Counties. Difficult to distinguish from overlying Fleming Formation in both surface exposures and in well logs.	May yield small amounts of fresh water in the most northern part of Austin County. Generally water is at least slightly saline.
	Undifferentiated	—	Alternating beds of gray sand, sandstone, and shale.	Does not crop out in Austin or Waller Counties.	Would yield only saline water.

Source: Texas Water Development Board, Report 68

Reproduced from best available copy.

Figure 4 describes a general cross-section of site hydrogeology. The first water-bearing unit, which is referred to as the water table aquifer, is identified in the cross-section as Stratum B. This aquifer is part of the sediments of the Brazos River Alluvium. The second water-bearing unit, know as the confined aquifer, is identified as Stratum D. This unit is part of the Evangeline aquifer. The clay layer know as Stratum E lies beneath the confined aquifer at about 100 feet in depth and was the deepest unit investigated at the site.

Ground water in the water table and confined aquifers generally flows towards the river, in a northwestern direction. However, during high river stage conditions (less than one third of the time) ground water flow in the water table aquifer may shift to the west and south. The predominant vertical hydraulic gradient is upwards towards the water table aquifer.

1.4 SITE INVESTIGATION RESULTS

A. Soil and Sludge

Extensive sampling of the site has focused on areas which are in close proximity to visible waste or were known to have received waste. Those areas include the lagoon, lagoon dikes and the evaporation system. Samples were also obtained from unaffected soils (background) on site, and water and sediment from the Brazos River and Clark Lake. A detailed description of this information may be found in the site RI/FS and Risk Assessment. A summary of the site data is found in Tables 2a and 2b.

Sludges in the lagoon range in thickness from about six inches to three feet. A water layer floats on top of the sludge and the water is covered in part by a thin oil and emulsion layer. The highest levels of contaminants detected at the site were found in the lagoon sludge.

The most significant classes of compounds found in the sludge in terms of concentration and toxicity include volatile organic compounds (VOCs) and polychlorinated biphenyls (PCBs). The highest concentrations of benzene and toluene (two VOCs) detected are 2500 ppm and 36,600 ppm, respectively. The highest concentration of PCBs found at the site is 223 ppm. High levels of base neutral compounds such as napthalene and phenols were also detected in the lagoon sludge. Of the heavy metals present, zinc was found at the highest levels (13,800 ppm).

The majority of the contamination identified in the evaporation system is found in isolated sludge deposits near the point of discharge from the lagoon to the evaporation system. Contaminants in the evaporation system sludge are similar to those in the lagoon but at lower concentrations. The remainder of evaporation system soils are generally characteristic of local background soils.

Sampling of the dike indicates that it contains a layer of affected soils and sludge at about three feet below the surface. Concentrations of con-

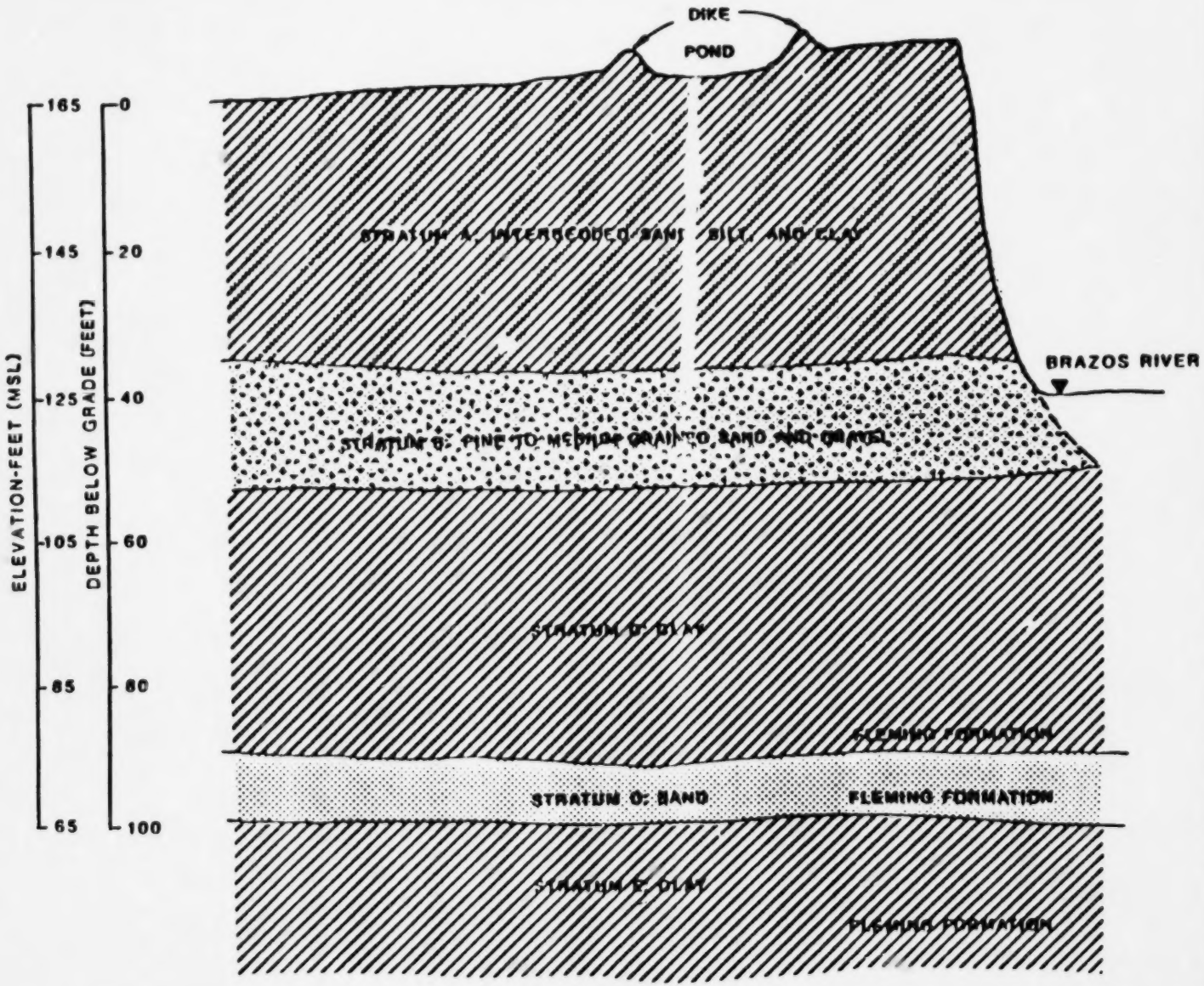

FIGURE 4
GENERAL SCHEMATIC SITE GEOLOGY
SHERIDAN DISPOSAL SERVICE

TABLE 2a

Summary of Organic Compounds Detected On-Site
Sheridan Disposal Services Site

Parameter	Pond Water: GEI Data July 1984 (ug/l)	Pond Water: EGA Data 06/18/87 06/21/87 (ug/l)	Floating Oil and Emulsion: EGA Data 07/31/87 (ug/kg)	Pond Sludge: GEI Data Composite Samples 03/22/84 (ug/kg)	Pond Sludge: GEI Data Composite Samples 05/30/84 (ug/kg)	Pond Sludge: EGA Composite Data 06/22/87 (ug/kg)	EGA Dike Soils 07/30-08/87 (ug/kg)	Evaporation System Sludge Deposits and Soils: GEI Data December 1985 (ug/kg)	Evaporation System Sludge Deposits and Soils: EGA Data 06/24-25/87 (ug/kg)	Background Soils: GEI Data December 1985 (ug/kg)
Volatile Fraction										
Acetone	ND	<0.020	<3.0	ND	ND	<230	<0.020-10	ND	ND	ND
Benzene	<0.50*	<0.000	<0.75	400	<3.500	170	<0.005-210	<0.022-67.5	<0.005-16	<0.022
2-Butanone (MEK)	ND	<0.020	<1.0	ND	ND	<230	<0.020-0	ND	ND	ND
Carbon Disulfide	ND	<0.005	<0.75	ND	ND	<45	<0.000-10	ND	ND	ND
Chlorobenzene	<0.50	<0.000	<0.75	ND	<250	<45	<0.005-6.1	<0.03-130.0	<0.005-<16	<0.030
1,2-Dichloroethane	<0.50	<0.005	<0.75	ND	<250	<45	<0.005-44	<0.014-<14.0	<0.005-<16	<0.014
1,1-Dichloroethylene	<0.50	<0.005	<0.75	ND	<250	<45	<0.005-0.57	<0.014-<14.0	<0.005-<16	<0.014
Ethylbenzene	<0.50*	<0.005	1.5	740	<6.400	500	<0.005-400	<0.030-370	<0.005-300	<0.030
2-Hexanone	ND	<0.010	<1.0	ND	ND	<90	<0.01-0.32	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	ND	<0.010	<1.5	ND	ND	<90	<0.01-77	ND	ND	ND
Methylene Chloride	<0.50	<0.025	<3.0	ND	<250*	<230	<0.025-33	<0.014*-0.221	<0.025-<72	<0.014
Styrene	ND	<0.005	<0.75	54.4	ND	340	<0.005-230	ND	ND	ND
Tetrachloroethylene	0.51	<0.005	<0.75	64	221	51	<0.005	<0.030-41.3	<0.005-<16	<0.021
Toluene	1.01	<0.005-0.070	0.75	1.750	<36.000	700	<0.005-100	<0.03-203	<0.005-67	<0.030
Trichloroethylene	2.91	<0.005	0.75	100	<250	<45	<0.005	<0.0005-<0.50	<0.005-<16	<0.0005
Xylenes*	ND	0.0002-0.007	2.3	2.700	ND	1000	<0.005-510	ND	ND	ND
Acid Fraction										
2,4-Dimethylphenol	<0.50*	<0.015	<90	500	224	450	<0.33-67	<0.00-494	<0.33-<33	<0.09
Phenol	3.50-13.04(a)	<0.015	<90	1.150	1.340	1500	<0.33-600	0.226-1.470	<0.33-66	<0.05
2-Methyl phenol	ND	<0.015	<90	150	ND	340	<0.33-61	ND	ND	ND
4-Methyl phenol	ND	<0.015	<90	ND	ND	850	<0.33-170	ND	ND	ND

ND - Not Reported
ND - Not Tested
* - Compound tentatively identified, but not quantified (below detection limit)
(a) - Composite sample collected March 20, 1984

Reproduced from best available copy.

TABLE 2a cont

Summary of Organic Compounds Detected On-Site
Sheridan Disposal Services Site

Parameter	Pond Water: REI Data July 1984 (mg/l)	Pond Water: ERM Data 06/16/87 (mg/l)	Floating Oil and Emulsion: ERM Data 07/21/87 (mg/kg)	Pond Sludge: REI Data Composite Samples 03/27/84 (mg/kg)	Pond Sludge: REI Data Composite Samples 05/30/84 (mg/kg)	Pond Sludge: ERM Composite Data 06/22/87 (mg/kg)	ERM Dike Soils 07/6-10/87 (mg/kg)	Evaporation System Sludge Deposits and Soils: REI Data December 1986 (mg/kg)	Evaporation System Sludge Deposits and Soils: ERM Data 06/24-29/87 (mg/kg)	Background Soils: REI Data December 1985
Base/Neutral Fraction										
Acenaphthene	<0.050	<0.015	<99	NF	<32	<130	<0.33-170	<0.063-<5,700	<0.33-<33	<0.063
Anthracene	<0.000	<0.015	<99	NF	33	<130	<0.33-<33	<0.063*-<5,700	<0.33-<33	<0.063
Bis-(2-ethylhexyl) phthalate	<0.050	<0.015	100	NF	<32*	<130	<0.33-4.6	<0.330-<30,000	<0.33-77	<0.033
Butyl benzyl phthalate	<0.000	<0.015	110	NF	<32	<130	<0.33-12	<0.330-<30,000	<0.33-21	<0.033
Chrysene	<0.000	<0.015	<99	NF	<32	<130	<0.33-4.7	<0.083-<7,600	<0.33-<33	<0.063
Dibenzofuran	NF	<0.015	<99	NF	NF	<130	<0.33-140	NF	NF	NF
Dimethyl phthalate	<0.050	<0.015	<99	NF	<32	<130	<0.33-33	<0.330*-<30,000	<0.33-<33	<0.33
Di-N-octyl phthalate	<0.000	<0.015	<99	NF	<32	<130	<0.33-8.0	<0.330-<30,000	<0.33-60	0.451
Fluorene	<0.000	<0.015	<99	NF	55.4	<130	<0.33-47	<0.063-<5,700	<0.33-<33	<0.063
Isophorone	0.077	<0.015	<99	NF	99.8	<130	<0.33-<33	<0.073-<6,600	<0.33-<33	<0.073
2-methylnaphthalene	NF	<0.015	<99	450	NF	330	<0.33-660	NF	NF	NF
Naphthalene	<0.050*	<0.015	<99	410	52	270	<0.33-47	<0.053-<4,600	<0.33-<33	0.145
N-nitrosodiphenylamine	<0.050	<0.015	<99	NF	<32	190	<0.33-34	0.075-<5,700	<0.33-<33	<0.063
Phenanthrene	<0.000	<0.015	<99	NF	42.8	<130	<0.33-<33	<0.100-<16,000	<0.33-<33	<0.100
Pesticides										
Alpha-BHC	<0.05	<0.005	<1.6	NF	<32	<0.64	<0.006-1.4	<0.330-<30,000	NF	<0.33
Gamma-BHC	<0.05	<0.005	<1.6	NF	<32	<0.64	<0.006-0.49	<0.330-<30,000	NF	<0.33
4,4'-DDD	<0.05	<0.01	<3.2	NF	<32	<1.3	<0.016-1.3	<0.100-<14,000	NF	<0.16
4,4'-DDE	<0.05	<0.01	<3.2	NF	<32	<1.3	<0.016-0.78	<0.100-<17,000	NF	<0.19
4,4'-DDT	<0.05	<0.01	<3.2	NF	<32	<1.3	<0.016-2.1	<0.093-<8,500	NF	<0.093
Dieldrin	<0.05	<0.01	<3.2	NF	<32	<1.3	<0.016-0.75	<0.063-<7,600	NF	<0.093
PCB's										
Aroclor 1016	<0.05	<0.050	<16	NF	<9.2	55	<0.04-<60	<1.2-<110,000	<8-<16	<1.2
Aroclor 1232	<0.05	<0.050	<16	NF	<9.2	<6.4	<0.04-11	<1.2-<110,000	<8-<16	<1.2
Aroclor 1242	<0.05	<0.050	32	143.73-154(C)	210	<6.4	<0.04-8.0	<1.2-<110,000	14-36	<1.2
Aroclor 1260	<0.05	<0.100	<32	44.0-76(C)	<9.2	13	<0.16-34	<1.2-<110,000	<16-<32	<1.2
Total PCB's	<20 (b)	NF	NF	132-223	NF	NF	NF	NF	NF	

NF - Not Reported
NT - Not Tested
* - Compound tentatively identified, but not quantified (below detection limit).
(b) - REI data reported in lab backup April 11, 1984 vs. floating oil samples (Ri. 1987)
(c) - Individual samples analyzed for PCBs only.

Reproduced from best available copy.

TABLE 2b

SUMMARY OF METALS DETECTED ON SITE
SHERIDAN DISPOSAL SERVICES SITE

METAL	POND WATER: RI, 1987 (a) (mg/l)	POND WATER: EPA 06/16/87 06/21/87 (mg/l)	POND SLUDGE: RI, 1987 (b) (mg/kg)	POND SLUDGE: EPA COMPOSITE 06/22/87 (mg/kg)	SLUDGE RCRA LEACHATE REI March 1984 (c) (mg/l)	DIKE SOILS EPA 7/6-10/87 (mg/kg)	EVAPORATION SYSTEM WATER REI 03/29/87 (mg/l)	EVAPORATION SYSTEM SOILS: TOTAL RI, 1987 (d) (mg/kg)	EVAPORATION SYSTEM SOILS: LEACHATE TWQB September 1976 (mg/l)	BACKGROUND SOILS: TOTAL REI December 1985 (mg/kg)	BACKGROUND SOILS: LEACHATE TWQB 11/12/76 (c) (mg/l)
Aluminum	NT	0.10-0.32	2450-6790	2300	NT	NT	NT	5,630-7,000	NT	NT	NT
Arsenic	<0.010-0.033	0.032-0.41	<2-2	20	<0.01	NT	<0.010	<1.43,1-2	NT	NT	NT
Barium	<0.50-1.6	0.10-0.10	<100-647.4	630	<0.50	NT	<0.50	60-120	NT	NT	0.030
Beryllium	NT	<0.001	0.5	<0.1	NT	NT	NT	0.25-0.5	NT	NT	NT
Boron	NT	NT	10-15	NT	NT	NT	NT	10	NT	NT	NT
Cadmium	<0.010-0.090	<0.005	0.4-2.3	2.7	<0.01	NT	<0.010	<1.43,0.15-31.4	<0.010	NT	<0.010
Calcium	0.03-1.77	50-75	NT	5300	NT	NT	NT	19.0-43.4	NT	NT	0.07
Chromium	0.30-2.27	0.01-0.02	19-302	160	<0.01	6-60	<0.010	<1.43-207.0	NT	6.1-56.1	<0.02
Cobalt	NT	<0.01	2.5-5	3	NT	NT	NT	2.5-6.67	NT	NT	NT
Copper	0.30-2.90	<0.01-0.005	15-366	130	NT	NT	0.02-0.04	5-41.4	NT	NT	0.010
Iron	30.2	0.30-0.40	4270-9910	4300	NT	NT	11.5-20.5	1,040-5,670	NT	NT	NT
Lead	<0.10-0.60	<0.000	<2-537.1	310	<0.01	<5-1300	<0.010	3-691.0	<0.050	<1-32.1	<0.050
Magnesium	2.50-5.5	20-29	NT	930	NT	NT	NT	2.37-6.66	1.06	NT	0.1
Manganese	2.57	0.29-0.41	144-244	71	NT	NT	0.60-1.60	103-241	NT	NT	NT
Mercury	<0.005	<0.0002-0.001	<1	0.06	<0.005	NT	<0.005	NT	NT	NT	0.00035
Nickel	0.130-1.24	<0.040	52-90	69	NT	5-30	<0.010-0.10	<1.43-43.5	NT	9.8-24.4	0.02
Potassium	NT	72-81	NT	<500	NT	NT	NT	1.7-3.6	NT	NT	NT
Selenium	<0.010	<0.004-0.041	<2	0.6	<0.01	NT	<0.010	0.2	NT	NT	NT
Silver	<0.010-<0.2	<0.005	<2	<50	<0.01	NT	<0.01-0.11	NT	NT	NT	NT
Sodium	NT	272-330	NT	2200	NT	NT	NT	4.9-17.1	NT	NT	0.00050
Vanadium	NT	<0.01-0.010	20	25	NT	NT	NT	20	NT	NT	NT
Zinc	0.390-9.0	<0.02-0.040	115.6-13600	970	NT	10-2900	0.01-0.03	15.5-1,270	NT	23.1-56	0.02

NT - Not Tested
(a) - Ranges include data from TWQB (October 1975, September 1976, April 1979, February 5, 1976) and REI (March 29, 1984) samples
(b) - Ranges include data from TWQB (March 1976), EPA FIT Team samples (July 1983) and a composite sample by REI (March 29, 1984)
(c) - Reported in the 1987 RI; see Tables 3-7 and 3-9 for REI and TWQB leachate data respectively. Appendix 3a for TWQB leachate (Sept. 1976).
Note that background evaporation system soil leachate of 11/76 is only one sample point
and leachate procedure not well documented. Therefore, data may not be representative
(d) - Ranges include data from EPA FIT Team sample (July 1983) and REI sample (March 27, 1984).

Reproduced from best available copy.

taminants of concern in this layer are generally at least ten times less concentrated than those found in the lagoon. Surface contamination is also visible on the dike. This contamination is most pervasive in the tank and incinerator area of the dike. The extent of this contamination on the dike was not determined during the RI/FS; however, confirmatory sampling during remedy implementation will verify that all contamination above the action level is addressed by the remedial action.

The cost estimates developed for the alternatives used a common design based on the following estimated waste volumes:

Pond sludge	30,000 yd^3
Affected soil under pond	10,000 yd^3
Evaporation System Sludge	1,000 yd^3
Oily-dike surface soil	3,000 yd^3
Floating Oil & Emulsion	300 yd^3

These estimates are based on a 25 ppm PCB cleanup level as well as a visual estimate of highly contaminated soils and wastes.

B. Surface Water

Sampling of the Brazos River downstream and upstream of the site indicated that there was no measureable difference between the downstream and upstream samples. Sediment samples were also obtained from the river bottom at locations downstream and upstream of the site. Concentrations of organic constituents indicated that the site had not impacted the sediment however, concentrations of metals were slightly higher in the downstream sample than the upstream sample. Analyses of Clark Lake water and sediments do not exhibit elevated levels of site contaminants.

C. Ground Water

Over thirty wells have been installed at the site in both the shallow and deep aquifers to determine the extent of contamination and evaluate site hydrogeology. Tables 3a and 3b show the highest levels of contaminants detected in the shallow wells to date. No contamination has been detected in the deep aquifer. The only group of contaminants identified in the shallow ground water are volatile organics. The highest concentration of contaminant detected during recent sampling was benzene, at 0.027 ppm. The Ground water Migration Management RI/FS is ongoing, and the Record of Decision for the Ground Water operable unit is expected to be completed by September 1989. However the remedy for the Source Control operable unit described in this Record of Decision will be fully consistent with the ultimate remedy for the site.

Reproduced from best available copy.

TABLE 3a

Results of Priority Pollutant GC/MS Analyses for the Source Control RI Sheridan Disposal Services Site

Well Number:		MW-3	MW-6	MW-16	MW-2	MW-7	MW-14
Date Sampled		6/29/84	6/29/84	6/29/84	6/29/84	6/29/84	12/19/85
Aquifer		Unconfined	Unconfined	Unconfined	Confined	Confined	Confined
Parameter	Units						
Volatiles							
Chlorodibromomethane	ppb	11	ND	ND	ND	ND	ND
Chloroform	ppb	60	ND	ND	ND	ND	ND
Dichlorobromomethane	ppb	63	ND	ND	ND	ND	ND
Methylene Chloride	ppb	ND	ND	ND	BMDL (<10)	ND	5 J[1]
1,1,1-Trichloroethane	ppb	11	ND	ND	ND	ND	ND
Acid Extractable Fraction							
	ppb	ND	ND	ND	ND	ND	ND
Base/Neutral Extractable Fraction							
Bis (2-Ethylhexyl) Phthalate	ppb	BMDL (<10)	BMDL (<10)	BMDL (<10)	ND	10 [1]	ND
Isophorone	ppb	30	ND	BMDL (<10)	ND	ND	ND

NOTES:

ND = Not Detected.

BMDL = Tentatively identifie at concentrations below method detection limits.

[1] = False positive result. since laboratory blank sample analyzed positive for these compounds.

Reproduced from best available copy.

TABLE 3b

Results of Priority Pollutant Sampling, October 1987 for Wells Screened in Unconfined Aquifer
Sheridan Disposal Services (ppb)

Well Number	005	013	004	021	002	001	014	015	020	017	018	024	012
Date Sampled	MW-10 10/27/87 Upgrad.	MW-12 10/28/87 Upgrad.	MW-6 10/27/87 Downgrad	MW-18 10/28/87 Downgrad	MW-19 10/27/87 Downgrad	MW-29 10/27/87 Downgrad	MW-31 10/28/87 Downgrad	MW-32 10/28/87 Downgrad	MW-34 10/28/87 Downgrad	MW-36 10/29/87 Downgrad	MW-37 10/29/87 Downgrad	MW-38 10/30/87 Downgrad	MW-39 10/28/87 Downgrad
Constituents													
VOLATILE ORGANICS													
Benzene	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	27(5)	ND(5)	ND(5)	ND(5)	ND(5)
Tetrachloroethene	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	13(5)	21(5)	ND(5)
trans-1, 2-Dichloroethene	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	25(5)	ND(5)	5.2(5)	ND(5)	ND(5)
Trichloroethene	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	15(5)	ND(5)	ND(5)	13(5)	ND(5)
BASE/NEUTRAL/ ACID EXTRACTABLE ORGANICS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PESTICIDES/ PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METALS													
Arsenic	ND(.003)	ND(.003)	.007(.003)	ND(.05)	ND(.003)	.005(.003)	.006(.003)	ND(.003)	ND(.003)	ND(.003)	ND(.003)	ND(.003)	.043(.003)
Copper	ND(.006)	.012(.006)	ND(.006)	ND(.006	ND(.006)	ND(.006)	ND(.008)	ND(.006)	ND(.006)	ND(.006)	ND(.006)	.006(.006)	ND(.006)
Selenium	ND(.004)	ND(.004)	ND(.002)	ND(.004	ND(.004)	ND(.004)	ND(.004)	ND(.002)	ND(.002)	.01(.004	ND(.004)	ND(.004)	ND(.004)
Zinc	.04(.01)	.06(.01	.05(.01)	.07(.01,	.06(.01)	.02(.01)	.07(.01)	.05(.01)	.06(.01)	.07(.01)	.04(.01)	.11(.01)	.04(.01)

Notes:
ND = Not Detected
Detection Limits in Parentheses

D. Air

Extensive air sampling has been completed at the site. No priority pollutant constituents were detected at concentrations above ambient background levels.

1.5 TREATABILITY TESTING

While generally available information will give an indication of the potential applicability of a given remedial technology, performance of actual laboratory tests using site-specific materials is often a better method for determining the appropriateness of a remedial technology. For this reason, treatability studies were performed at the Sheridan site. The Sheridan Site Committee elected to undertake studies to evaluate the applicability of Biotreatment, Solvent Extraction and Stabilization technologies to treat site wastes. The results of these studies are presented in Appendices B, C and D of the FS and summarized below.

The Sheridan Site Committee conducted stabilization tests on samples of sludge obtained from the lagoon. Sludge was stabilized by Committee consultants using fly ash and samples were also sent to two stabilization vendors, Enreco and Soliditech for stabilization using their proprietary methods. Fly ash alone was not found to result in a stabilized waste with sufficient structural strength to support earth moving equipment during the construction of a cap.

The proprietary methods improved compressive strength characteristics but leaching tests of the stabilized wastes indicated significant levels of volatile organic compounds such as benzene in the leachate. The Site Committee has also conducted additional stabilization testing which will be discussed in the Responsiveness Summary.

Two phases of biotreatment studies were conducted by the Sheridan Site Committee. Samples of lagoon sludge were placed in aqueous bioreactors containing organism seed materials. Soil obtained from the edge of the lagoon, sludge from an industrial waste treatment lagoon and proprietary seed from General Electric and Microbe Masters were used as sources of microorganisms in the experiments. The reactors were generally operated under aerobic conditions and sufficient nutrients (nitrogen, phosphorus) were added as necessary to maintain the microorganisms.

Sampling of the reactors was conducted after 71 days and semiquantitative mass balances were conducted to evaluate the amount of contaminant removal which occurred. This analysis indicated that essentially all the volatile organics present in the sludge were removed and at least 84 percent of the semi-volatile organics were degraded. The amount of organic reduction due to volatilization was not determined in the studies. The PCB removal results were less clear due to high PCB detection levels and variable original PCB content of the sludge, but they suggested that some PCB reduction had occurred.

A sample of lagoon sludge was sent to the Resources Conservation Company for treatment using their proprietary "B.E.S.T" solvent extraction techniques. In this method, the sludge is separated into three distinct phases, oil, solids and water. The PCBs and other organic constituents are concentrated in the oil which is then treated by methods such as incineration or chemical dechlorination. The metals present were concentrated in the solid phase. This method was found to effectively segregate PCBs into the oil layer and the solids generated would probably not require disposal as a hazardous waste.

1.6 POTENTIAL IMPACTS OF THE SITE ON HUMAN HEALTH AND ENVIRONMENT

The assessment of risk posed by the Sheridan site was evaluated in the Sheridan Risk Assessment. This assessment examined the amount, concentration, properties, and environmental fate and transport of chemical found at the site; the populations and environments potentially at risk; exposure pathways; and potential exposure events. The document described the risks associated with current and future (probable and worst-case) exposure scenarios. The numerical cancer risk values discussed below are theoretical quantifications of the excess lifetime cancer risk, that is, the increased probability of contracting cancer as a result of exposure to wastes, compared to the probability if no exposure occurred. For example, a 10^{-6} excess cancer risk represents an exposure that could result in one extra cancer case per million people exposed.

Under current conditions which assume restricted site access and maintenance of the site, the only potentially significant pathway is migration of contaminants into the Brazos River. This pathway was modelled using very conservative assumptions, resulting in an upper bound excess cancer risk from the ingestion of PCBs in fish of 1.5×10^{-5}. Modelling using less conservative assumptions indicated that the 1×10^{-6} excess cancer risk would not be exceeded.

Both models utilized are relatively conservative. However, neither model is capable of accounting for processes such as sorption to colloids and enhanced solubility due to co-solvent effects, which are recognized as facilitating the transport of PCBs in ground water. Although these processes cannot be accounted for by modelling, they increase the potential for PCBs to affect the river.

The second scenario evaluated was the most probable future land use which assumed continued agricultural (rangeland) land use and unrestricted access to the waste disposal area. Under this scenario, there are two major exposure pathways in addition to the ground water transport pathway described in the current scenario. These pathways are 1), direct contact (ingestion and dermal absorption) with sludge and 2), release of all site wastes into the Brazos

River due to the eventual erosion and failure of the river bank between waste and the river.

The total excess cancer risk due to direct contact with site sludge was calculated to be about $7x10^{-5}$. The risk associated with the river bank erosion scenario was not quantified because it is impossible to accurately predict the rate of erosion, subsequent bank failure and release of contaminants into the river. However, the potential risks due to biological uptake of wastes may be significant.

The last scenario evaluated in the Risk Assessment is the worst-case scenario of residential development adjacent to the waste areas. The pathways previously described for the current and most likely future use scenarios would be similar in the residential scenario. However, an additional exposure pathway of ingestion of contaminated ground water would result in a total excess cancer risk greater than 1×10^{-3} as well as a significant non-carcinogenic risk. This Record of Decision will address the ground water exposure pathway by eliminating the source of continued contamination.

The preceding paragraphs describe potential impacts to human health. In addition to impacts to human health, the lagoon sludge poses an environmental threat to wildlife, especially birds which may land on its surface and die from contact with the sludge.

II. ENFORCEMENT

The Sheridan Site Committee has identified over 150 potentially responsible parties (PRPs) for the site. To date, 102 Notice/104(e) information requests were sent to site PRPs. Remaining PRPs will be notified when Special Notice letters are issued. EPA will continue its enforcement activities and send Special Notice Letters to PRPs prior to the initiation of the remedial design. Should the PRPs decline to conduct future remedial activities, EPA will either take enforcement actions or provide funding for these activities while seeking cost recovery for all EPA-funded response actions from the PRPs.

III. COMMUNITY RELATIONS

In general, there has been a long history of citizen awareness of the Sheridan Disposal Services site. In the early 1970s when incineration at the site resulted in air emissions, people living within a 7-mile radius complained. In 1971 a citizens' group submitted a petition with over 500 signatures to the Texas Water Quality Board calling for its closure.

However, community concerns of either the area residents or local officials are now very low, probably because the site has been inactive since 1984. Also the site is relatively remote and there are no residences within a mile.

On November 15, 1988, EPA issued a press release and the Proposed Plan fact sheet was mailed on November 9. The press release was sent to all news organizations in the Houston/Hempstead/Brenham area. The fact sheet was mailed to 92 residents and local officials. Extra copies of the fact sheet were provided to the five area repositories.

In accordance with CERCLA, Section 117, the press release and proposed plan fact sheet announced the comment period of November 15 through December 15, 1988. A public meeting was held on November 22, 1988, at the Waller County Courthouse. Forty people attended the meeting and two made statements or asked questions. Additional written comments were received from four people or organizations.

IV. ALTERNATIVE EVALUATION

4.1 EVALUATION CRITERIA

In accordance with Section 121 (a), (b), and (d) of the Superfund Amendments and Reauthorization Act (SARA), EPA has determined that nine factors must be considered in selecting a remedy for a Superfund site. These items are summarized below:

1. Consistency with Other Environmental Laws

   In determining appropriate remedial actions at Superfund sites, consideration must be given to the requirements of other Federal and State environmental laws, in addition to CERCLA as amended by SARA. Primary consideration is given to attaining applicable or relevant and appropriate Federal and State public health and environmental laws and regulations and standards. Not all Federal and State environmental laws and regulations are applicable to each Superfund response action. The compliance of each remedial alternative with all applicable or relevant and appropriate environmental laws is discussed in Appendix C.

2. Reduction of Toxicity, Mobility or Volume

   The degree to which alternatives employ treatment that reduces toxicity, mobility or volume must be assessed. Relevant factors include:

   o the treatment processes the proposed solutions employed and materials they treat;

   o the amount of contaminated materials that will be destroyed or treated;

   o the degree of expected reduction in toxicity, mobility, or volume;

   o the residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity for bioaccumulation of such hazardous substances and their constituents.

3. Short-term Effectiveness

The short-term effectiveness of an alternative must be assessed considering the following:

o Magnitude of reduction of existing risks; and

o short-term risks that might be posed to the community, workers, or the environment during the implementation of an alternative including potential threats to human health or the environment associated with excavation, transportation, and redisposal or containment.

4. Long-term Effectiveness and Permanence

Alternatives are assessed for the long-term effectiveness and permanence they afford along with the degree of certainty that the remedy will prove successful. Factors considered are:

o Magnitude of residual risks in terms of amounts and concentrations of wastes remaining following implementation of a remedial action, considering the persistence, toxicity, mobility, and propensity for bioaccumulation of such hazardous substances and their constituents;

o type and degree of long-term management required, including monitoring and operation and maintenance;

o potential for exposure of human and environmental receptors to remaining waste considering the potential threat to human health and the environment associated with excavation, transportation, redisposal, or containment;

o long-term reliability of the engineering and institutional controls, including uncertainties associated with the land disposal of untreated wastes and residuals; and

o potential need for replacement of the remedy.

5. Implementability

The ease or difficulty of implementing the alternatives are assessed by considering the following factors;

o Degree of difficulty associated with constructing the solution;

o expected operational reliability of the treatment technology;

o need to coordinate with and obtain necessary approvals and permits (or meet the intent of any permit in the case of Superfund actions);

o availability of necessary equipment and specialists; and

o available capacity and location of needed treatment, storage, and disposal services.

6. Costs

The types of costs that should be assessed include the following:

o Capital costs;

o operation and maintenance costs;

o net present value of capital and operation and maintenance cost; and

o [illegible] action costs.

7. Community Acceptance

This assessment should evaluate:

o Components of remedial alternatives that the community supports;

o features of the alternatives about which the community has reservations; and

o elements of the alternatives which the community strongly opposes.

8. State Acceptance (through the Texas Water Commission)

Evaluation includes assessment of:

o Components of remedial alternatives that the State supports;

o features of the alternatives about which the State has reservations; and

o elements of the alternatives which the State strongly opposes.

9. Overall Protection of Human Health and the Environment

Following the analysis of the remedial options against individual evaluation criteria, the alternatives are assessed from the standpoint of whether they provide adequate protection of human health and the environment.

EPA is also directed by Superfund law (SARA) to give preference to solutions that utilize treatment to remove contaminants from the environment. Offsite transport and disposal without treatment is the least preferred option where practicable treatment technologies are available.

4.2 DESCRIPTION OF ALTERNATIVES

In conformance with the National Contingency Plan (NCP), initial remedial approaches were screened to determine which might be appropriate for this site (see the Sheridan Disposal Services Feasibility Study for details of this evaluation). From these possible remedies, five were chosen for more detailed evaluation and comparison with the remedy selection criteria outlined above. In addition, "No Action" was evaluated to comply with the requirements of the NCP. Each remedy is summarized below. Common elements of all the plans include the following activities:

- o Install a RCRA-compliant cap over the entire pond and dike area.
- o Install a flexible spur jetty river bank erosion control system in the Brazos River.
- o Monitor ground water quality for a minimum of 30 years.
- o Decontaminate, disassemble and properly dispose of all on-site tanks and processing equipment.
- o Properly dispose of any drums encountered during remediation. Contents of intact drums will be treated on-site or disposed of off-site, depending on the nature of the material.
- o Treat potentially contaminated stormwater and waste-water streams resulting from the waste treatment alternatives, to remove solids, metal, and organic constituents. The treated water will comply with all Federal/State standards for discharge into the Brazos River.
- o Implement institutional controls to preclude use of contaminated ground water and ensure the long-term integrity of the cap.

Alternative 1: No Action - This alternative requires the sealing of old wells and installation of new monitoring wells, as necessary, and ground water monitoring for a minimum of 30 years.

Alternative 2: Soil Mixing - This alternative involves mixing one part contaminated soil and sludge with six parts clay rich soil to reduce excess moisture and provide a structurally stable foundation for the cap. The soil and waste mixture would be placed into a RCRA-compliant landfill in the main pond. The estimated cost of this alternative is $20,656,000.

Alternative 3: Stabilization - This alternative involves uniformly mixing the contaminated soil and sludge with a solidifying agent such as cement or flyash to form a solid material. Chemical additives may be added to reduce the leachability of contaminants or to improve strength or any other desir-

able property. After the waste is stabilized, it would be placed into a RCRA-compliant landfill in the main pond. The estimated cost of this alternative is $18,856,000.

Alternative 4: Biotreatment - This alternative would utilize an on-site aqueous biological system to remove organic waste constituents from the contaminated soils and sludge. Biotreatment will be conducted in tanks or impoundments and a pilot study will be conducted during remedial design to optimize biodegradation processes. This alternative will effectively remove all volatile and semi-volatile constituents from the waste. Emissions of volatile organic compounds during biotreatment will be destroyed using a fume incinerator, carbon absorption or equivalent system. During the design, all reasonable efforts will be made to optimize biodegradation of PCBs. If Biotreatment can reduce the level of PCBs in the residual to less than 50 ppm, the residuals will be stabilized, returned to the pond and capped. If the concentration of PCBs in the biotreatment residuals is greater than 50 ppm, they will be stabilized and returned to a RCRA-compliant landfill in the pond area. The estimated cost of the alternative is $28,346,000.

Alternative 5: Solvent Extraction - This alternative utilizes a chemical solvent(s) to separate the waste into oil, solids and water. Organic contaminants would be concentrated into the oil which would be incinerated onsite in a mobile incinerator or off-site. Metals would concentrate in the solid phase. These solids would be stabilized, if necessary, returned to the pond area, and capped. The water generated would be treated in the on-site waste water treatment system to remove inorganic and organic contaminants and discharged to the river. The estimated cost of this alternative is $36,508,000.

Alternative 6: Incineration - This alternative uses a rotary kiln to destroy essentially all of the organic contaminants in the waste. The ash will be transported to a RCRA-compliant off-site landfill for disposal. The estimated cost of this alternative is $39,610,000.

4.3 EVALUATION OF ALTERNATIVES

The following values were assigned to compare remedial selection criteria:

- "+" Alternative should exceed a criterion in comparison to other alternatives.
- "0" Alternative should meet the selection criterion.
- "-" Alternative will not meet a criterion, or will not meet a criterion as well as other alternatives.

A "+/0" or "-/0" designation indicates that the alternative is intermediate in

ranking between the + and the 0 or - and the 0 ratings. The rationale for the ratings assigned to each alternative is presented in the following subsections:

1. Compliance with ARARs

With the exception of the No Action alternative, all alternatives were rated "0" because they are designed to comply with ARARs described in Appendix A. The No Action remedy was rated "-" because it does not meet closure ARARs or the requirements of the PCB Spill Cleanup Policy and it does not address risk-based remedial objectives.

2. Reduction of Mobility, Toxicity and Volume

The No Action alternative is ranked "-" because it does nothing to reduce toxicity, mobility or volume. Soil Mixing is also ranked "-" since it minimally reduces waste mobility via largely reversible chemical reactions with the soil matrix but does not reduce waste toxicity and greatly increases waste volume. Stabilization is rated "0" because it more effectively reduces waste mobility than soil mixing, but does not significantly reduce toxicity, and increases waste volume. In Biotreatment, most of the organic contaminants will be destroyed and mobility and overall waste volume reduced. Therefore, Biotreatment is rated "+/0". Incineration and Solvent Extraction (in conjunction with incineration) are ranked "+" since both result in the greatest reduction of toxicity, mobility and volume.

3. Short-Term Effectiveness

With the exception of the No Action alternative, which is ranked "-", all alternatives effectively reduce the magnitude of existing short-term risks in two to five years. The time to complete remediation is two years for Soil Mixing and Stabilization, three years for Biotreatment, four years for Solvent Extraction and five years for Incineration.

Also, the alternatives differ with regard to risks to the community, workers, or the environment during implementation. All action alternatives involve the risks attendant to construction involving heavy earth work, including risks to workers and environmental impacts due to dust and noise. Further, all action alternatives will release volatile organics to some degree as the pond sludge is removed for treatment.

The risks associated with Soil Mixing and Stabilization occur over the shortest time. However, the volatile emissions resulting from these alternatives should be greater than Biotreatment, which will control fugitive emissions during treatment. Therefore, Soil Mixing and Stabilization are ranked "0" and Biotreatment is ranked "+". Solvent Extraction will require slightly longer to complete and involve additional handling and processing equipment and is also ranked "0". The Incineration

alternative is ranked "-" because of increased risks to on-site workers due to increased materials handling requirements and unit processes involving high temperature combustion, rotary machinery and periodic vessel entry, and its longer period of operation.

4. Long-Term Effectiveness and Permanence

Except for the No Action alternative, which is ranked "-", a major difference between the alternatives is the degree which they minimize the long-term risks from leaching of waste constituents and exposure to residual waste. The Soil Mixing alternative is ranked "-" because waste constituents are less effectively immobilized than in other alternatives and this alternative results in a larger residual volume relative to other alternatives. The Stabilization alternative is ranked "0/-" because the degree of mobility reduction for the Stabilization alternative is probably greater than for Soil Mixing, but the residuals will contain significantly more contaminants and be of greater volume than other alternatives. The Biotreatment alternative is ranked "+" because this process would destroy the mobile organic compounds contained within the waste, that is, the volatiles and semivolatiles. Certain compounds, such as PCBs, would be more difficult to degrade. Even if not degraded, however, the potential for mobility of these compounds would be reduced through elimination of the more mobile constituents in the waste matrix and stabilization. Incineration and Solvent Extraction are ranked "+" because they are the only alternatives which destroy essentially all of the organic contaminants in the waste and involve the least residual volume.

5. Implementability

The No Action alternative would be the easiest to implement and is rated "+". Among the remaining alternatives, the Soil Mixing and Stabilization alternatives are readily implementable. They are ranked "+" because they are mechanically simple and readily adaptable to field conditions, and they do not require special equipment or off-site facilities. The

Biotreatment alternative is ranked "0" because it will probably require the construction of specialized treatment tanks to accommodate the special mixing and sludge handling needs of that alternative. Still, Biotreatment is a demonstrated technology, is adaptable to unexpected waste characteristics and does not require operators with a high level of training. By contrast, the Solvent Extraction and Incineration alternatives are ranked "-" because these technologies are mechanically complex, require highly specialized equipment and operators, and may require an approved off-site

disposal facility for ash. In addition, Solvent Extraction may be difficult to adapt in the field.

6. Cost

Estimated costs for each alternative are summarized in Table 4. Included in this table are total capital costs, total post-closure operation and maintenance costs, total present worth and replacement costs. Replacement costs were included to evaluate the potential costs that would be incurred if the alternative were to fail. The likelihood of failure is largely determined by the degree the alternatives ensure the long-term permanence and effectiveness of the remedy. As described in Section 4.3, Soil Mixing and Stabilization receive the lowest rating for Long-term Effectiveness and Permanence and are therefore most likely to require replacement in the future. The replacement costs are estimated assuming on-site incineration is used as the replacement technology and vary according to the estimated residual volume which would require treatment.

7. Community Acceptance

The community has voiced limited support for the Biotreatment alternative and has not expressed any concerns about the alternative. Therefore biotreatment is rated "+" and all other alternatives are rated "0".

8. State Acceptance

The State of Texas, through the Texas Water Commission, has indicated that they have no objection to the selected alternative. Therefore, Biotreatment is rated "+" and all remaining alternatives are rated "0".

9. Overall Protection of Human Health, Environment

The No Action alternative is ranked "-" because the potential exposures by direct contact to waste, bank failure and inundation of the wastes and leaching to groundwater are not controlled. All remaining alternatives prevent these exposures but differ in the degree they ensure long-term effectiveness and permanence and achieve short-term effectiveness. Therefore, Soil Mixing is ranked "0/-" because it results in the greatest volume of waste residual without significant treatment. Stabilization is ranked "0" because it decreases the mobility of the waste without decreasing waste toxicity; however, it increases waste volume. Biotreatment is ranked "+" because this alternative degrades most organic waste constituents as well as reducing waste mobility and volume. Solvent Extraction is ranked "+" because all contaminants are destroyed to the maximum extent possible. Incineration also achieves similar destruction, but is rated "+/0" because it is less effective in the short-term.

TABLE 4

Cost Summary of Remedial Alternatives (in dollars)

	ALT 1 NO ACTION	ALT 2 SOIL MIXING	ALT 3 STABILIZATION	ALT 4 BIOTREATMENT	ALT 5 SOLVENT EXTRACTION	ALT 6 INCINERATION
Total Capitol Cost	90,000	19,662,000	17,993,000	27,483,000	35,645,000	38,747,000
Total Post Closure Operation and Maintenance Costs	460,000	994,000	863,000	863,000	863,000	863,000
Total Present Worth	370,000	20,216,000	18,466,000	27,956,000	36,118,000	39,220,000
[1]Replacement Cost	0	Greater than[2] 100,000,000	45,000,000	30,000,000	0	0

[1] Estimated using expected residual volume increase or reduction and the Sludge volume Sensitivity Cost Analysis in the Feasibility Study

[2] Value is approximate since the cost sensitivity analysis only evaluated up to a 50% volume increase and this alternative involves a 6-fold increase.

4.4 OPERATION AND MAINTENANCE

Site operation and maintenance will include a program for sampling on-site ground water monitoring wells. Additional site maintenance will include, but not be limited to inspection and repair (as necessary) of the erosion control system in the Brazos River, the cap or landfill and the perimeter fence, and maintenance of surface vegetation and appropriate drainage. The details of these activities will be defined in the Operation and Maintenance Plan of the remedial design.

V. SELECTED REMEDY

Based on the information provided in the administrative record and the results of the evaluation of alternatives (Section 4.3), the "final" remedy has been selected. It is EPA's judgement that the Biotreatment alternative best satisfies both the statutory and selection criteria in comparison to the other alternatives evaluated in this document.

Biotreatment will significantly reduce waste mobility, toxicity and volume and essentially eliminate the source of contaminants to ground water. Further, Biotreatment will result in the destruction of all mobile organics which could migrate into the environment if the containment system were to fail. It is the least costly alternative which will attain these goals; therefore, it is the most cost-effective alternative.

If Biotreatment can reduce the level of PCBs in the residuals to less than 50 ppm, the residuals will be stabilized, returned to the pond and capped. If the concentration of PCBs in the biotreated residuals is greater than 50 ppm, they will be stabilized and returned to to a RCRA-compliant landfill in the pond area. Waste requiring remediation by Biotreatment shall be defined as the following:

1. All material containing greater than 25 ppm of PCBs. This material includes the sludges contained in the pond and evaporation system;

2. Floating oil and emulsion in the pond and in on-site storage tanks;

3. Affected soil under pond - Affected soil under the pond is defined as soil that is intermixed with sludge or contains greater than 25 ppm of PCBs. The extent of affected soil under the pond will be determined during the remedial design/remedial action.

4. Dike surface soils - This material shall include: 1) oily soil on the inside dike slope between the current sludge level to the highest level the floating oil layer has contacted; 2) Grossly contaminated soil and sludge deposits visible on the dike. At a minimum, this shall include the soil and sludge in the vicinity of the treatment tanks and incinerator in the north-northeastern portions of the dike.

5. The wastes described in items 1-4 above address all wastes containing over 25 ppm of PCBs and/or high concentrations of other organics such as benzene and phenol.

In addition to treating the waste described above by Biotreatment the remedy shall also include the implementation of the common elements described in Section 4.2. of this Record of Decision and section of 5.2 of the Source Control FS.

Appendix A

Applicable or Relevant and Appropriate Requirements (ARARs)

Section 121(d) of CERCLA, as amended by SARA, describes the types of standards that a remedial action is required to meet. The fundamental standard for evaluating remedies under Section 121 remains "protection of human health and the environment". In addition, the standards, requirements, criteria, or limitations under any Federal environmental law, or any more stringent State standard, that are "legally applicable" or "relevant and appropriate" must be met. To obtain compliance with this requirement, remedial alternatives were analyzed to determine what regulatory requirements would be applicable or relevant and appropriate. Table A-1 presents the universe of environmental standards that were reviewed to determine which of them had a bearing on remedial action at the site.

ARARs must be determined on a site-specific basis. The main feature of the Sheridan site is the 15-acre pond or surface impoundment used for past disposal activities. In conducting the ARARs evaluation, it became clear that while there are various regulatory provisions that are either applicable or relevant and appropriate depending on the type of technology utilized, the one key ARAR that would be relevant and appropriate upon completion of the selected remedy was the surface impoundment closure requirements under RCRA. Those closure requirements are the foundation of the remedial alternates developed and evaluated in the FS.

Where closure will take place with some hazardous constituents remaining on-site, the surface impoundment must be closed as a landfill. Under these closure requirements, free liquids would have to be removed from the main pond. In addition, the remaining material would have to be stabilized or solidified to a bearing capacity sufficient to support a final cover. Finally, a cover would have to be placed over the impoundment designed and constructed to:

(A) Provide long-term minimization of the migration of liquids through the closed impoundment;

(B) function with minimum maintenance;

(C) Promote drainage and minimize erosion or abrasion of the final cover;

(D) Accommodate settling and subsidence so that the cover's integrity is maintained; and

Table A-1

STANDARDS, REQUIREMENTS, CRITERIA, OR LIMITATIONS EVALUATED FOR ARARs DETERMINATION

- Safe Drinking Water Act
- Clean Water Act
- Solid Waste Disposal Act (RCRA)
- Toxic Substances Control Act (TSCA)
- Occupational Safety and Health Act
- Hazardous Materials Transportation Act
- National Historic Preservation Act
- Archaeological and Historical Preservation Act
- Historic Sites, Buildings and Antiquities Act
- Fish and Wildlife Coordination Act
- Endangered Species Act
- Rivers and Harbors Act of 1899
- Wilderness Act
- Scenic River Act
- Coastal Zone Management Act
- Texas Clean Air Act
- Texas Solid Waste Disposal Act
- Texas Water Code
- Texas Water Quality Standards
- Marine Protection, Research and Sanctions Act
- Executive Order Requirements for Flood Plains and Wetlands
- Federal Insecticide, Fungicide, and Rodenticide Act

(E) Have a permeability less than or equal to the permeability of any bottom liner or natural subsoils present.

Further, following closure, the integrity and effectiveness of the final cover must be maintained, including making repairs as necessary.

An evaluation of the potential ARARs for affected materials and soils, for discharge to surface water, for ground water, and for air emissions results in the identification of the following relevant and appropriate criteria or standards:

1. RCRA requirements contained in 40 CFR, Part 264, listed in Table A-2.

2. RCRA requirements contained in 40 CFR Parts 262 and 263 to the extent that a remedial alternative involves off-site transportation of materials. Additionally, 49 CFR Parts 107 174-177 relating to Hazardous Materials Transportation would be relevant and appropriate.

3. RCRA requirements contained in 40 CFR Part 264, Subpart B, related to general facility standards, consisting of:

   a. 40 CFR Section 264.14 (site security).
   b. 40 CFR Section 264.17 (incompatible waste).

4. RCRA requirements contained in 40 CFR Part 264, Subpart G, consisting of:

   a. 40 CFR Section 164.114 (equipment decontamination).
   b. 40 CFR Section 264.117 (monitoring).

5. RCRA requirements contained in 40 CFR Part 264, Subpart M relating to land treatment.

   a. 40 CFR SEction 264.273.
   b. 40 CFR Section 264.278.

6. RCRA requirements contained in 40 CFR Part 264, Subpart N relating to landfills.

Table A-2

APPLICABLE OR RELEVANT AND APPROPRIATE RCRA REQUIREMENTS

A. Cover (40 CFR Part 264, Sub-part N)

1. Eliminate Free Liquids.

2. Stabilize to a bearing capacity sufficient to support final cover.

3. Cover designed to:

   a. provide long term minimization of migration of liquids through closed area;
   b. function with minimum maintenance;
   c. promote drainage and minimize erosion;
   d. accommodate settling and subsidence so that cover integrity is maintained; and
   e. have a permeability less than or equal to permeability of any bottom liner system or natural subsoil.

4. Post-Closure Designed to:

   a. maintain integrity and effectiveness of cover;
   b. maintain ground water monitoring system;
   c. prevent run-on and run-off from eroding or otherwise damaging final cover; and
   d. prevent disturbance of cover.

B. Incinerator (40 CFR Part 264, Support O and 40 CFR Section 761.70)

1. Incinerator equipped with high-temperature secondary combustion chamber and wet scrubber designed to meet particulate, HCL and destruction removal efficiency limitations.

7. TSCA requirements contained in 40 CFR Part 761, Subpart D, consisting of:

   a. 40 CFR section 761.70 (incineration)

8. TSCA requirements contained in 40 CFR part 761, Subpart G.

9. Section 4.01 of the Texas Clean Air Act.

10 Sections 329.41-.49, 333.17-.19 of Chapter 31 of Texas Administrative Code Relating to State Water Quality Standards as applied to the Brazos River.

11. Federal Water Quality Criteria for Fresh Water Aquatic Life Protection, and Consumption of Organisms.

12. Clean Water Act requirements for application of best engineering judgment prior to discharge, 40 CFR Part 125.

   a. Process water and potentially contaminated storm water collected and routed, as necessary, to activated sludge waste water treatment system equipped with carbon polishing.

13. All developed remedial alternatives have taken into account Executive Order 11988 on Flood Plain Management and will be implemented in such a manner as to minimize any impact on the flood plain.

In addition to these ARARs, during site remediation the Worker Health and Safety Plan would require compliance with the relevant provisions of the Occupational Health and Safety Act.

Additional details on how these ARARs were identified are outlined below.

ARARs for Affected Material and Soils

RCRA Requirements

Even though they are not legally applicable, certain RCRA requirements, including the RCRA design and operating standards, may be considered relevant and appropriate based on the fact that they address problems or situations sufficiently similar to those encountered at the Sheridan site.

Land Ban Requirements

Waste banned pursuant to the Hazardous and Solid Waste Amendments of 1984 (HSWA) cannot be placed in or on the land unless first treated to levels achieved by best demonstrated available technology (BDAT) for each hazardous constituent in the waste.

In order for the Land Disposal restrictions (LDR) to be ARARs for the site, RCRA listed wastes have to have been disposed of in the lagoon, or the waste must currently be a characteristic (i.e., corrosive, ignitable) waste. The waste at the Sheridan site does not exhibit RCRA characteristics and RCRA listed wastes are believed to have been disposed of at the site. However, based on currently available information, these wastes were probably incinerated on-site rather than disposed of in the pond. Therefore, the LDR will not be considered an applicable standard for the remedial activities at Sheridan. Additionally, because the contaminated medium consists of soil and debris, the RCRA Land Disposal Restrictions will not be a relevant or appropriate requirement for the remedial activities at Sheridan since the LDR BDAT standards were based on products in a waste stream, not soil and debris. However, if available LDR guidance (currently undergoing revision) changes or if additional information becomes available, the applicability of the LDR may be reevaluated.

PCB Contaminated Waste

The presence of PCBs has been detected in samples collected at the site. Generally, the manufacture, treatment and disposal of PCBs is regulated under the Toxic Substances Control Act (TSCA), 15 U.S.C. Section 2601 et seq. In April 1987, the EPA published a general PCB Spill Cleanup Policy, 40 CFR Sections 761.120-761.135 (1987). This policy is intended to deal with unintentional spills, leaks or other uncontrolled discharges of materials containing PCBs in concentrations of 50 ppm or greater. This policy established requirements for the cleanup of these spills where PCBs have been released into the environment. Different cleanup levels are established depending upon the spill location, the potential for exposure to residual PCBs remaining after the cleanup, the concentration of PCBs initially spilled, and the nature and size of population at risk of exposure.

By its terms, the EPA PCB spill policy only applies to spills which occur after the effective date of the policy, which was May 4, 1987 [40 CFR Section 761.120 (a)(1)]. Clearly, these requirements are not applicable to residual PCBs remaining at the Sheridan site. However, the nature and scope of these regulations is such that they are considered relevant to site conditions. Specifically, the level of 25 ppm in 40 CFR Section 761.125 (c)(3) is the most appropriate action level for the Sheridan site.

The TSCA cleanup policy is an ARAR that defines action levels for cleanup. Action levels, in this sense, are levels of concentration of PCBs in material at or above which the material must be remediated.

ARARs for Discharge to Surface Water

The Brazos River runs adjacent to the site and may be subject to point source discharges from the site during remediation. The point sources may consist of water generated by remedial activities as well as stormwater flows. This discharge may be treated as necessary by physical and chemical treatment, principally carbon adsorption, prior to discharge. At the completion of remediation, there will be no point source discharge.

However, at the completion of remediation, the Brazos may be impacted by a non-point source discharge, namely ground water seepage from the upper unconfined sand zone. The only standards that could be "legally applicable or relevant and appropriate" to this discharge would be State water quality standards or Federal water quality criteria.

State water quality standards are legally enforceable counterparts to the Federal water quality criteria. In Texas, the State water quality standards are set forth in Chapters 319 and 333 of the rules and regulations of the Texas Water Commission. Those standards establish certain numerical criteria which are legally applicable to waters in the Brazos. All remedial alternatives are designed to satisfy the requirements of 31 TAC Sections 319.21-29, 307.1 to 307.10 for the discharge of water from the upper unconfined sand zone to the Brazos.

With respect to concentrations of chemicals in the river:

(1) Final Maximum Concentration Limits (MCLs) are considered relevant and appropriate where MCLs are available; and

(2) State and Federal water quality criteria for the protection of human health are relevant and appropriate where MCLs are not available.

ARARs for Ground Water

The EPA's ground water protection strategy is based on the "differential protection" of ground water (i.e., ground water protection as it relates to a specific classification of an aquifer). Under the strategy, ground waters are classified as follows:

- Class I - ground waters that are highly vulnerable and either an irreplaceable source of drinking water or ecologically vital;

- Class II - ground waters currently used or potentially available for drinking water or other beneficial use; and

- Class III - ground waters not a potential source of drinking water and of limited beneficial use.

For Class I and Class II ground water Maximum Concentration Limits (MCLs) established under the Safe Drinking Water Act would be applicable for ground water sources which qualify as a public water system or a community water system. MCLs may also be relevant and appropriate to ground water that would not currently qualify as such systems but could potentially so qualify in the future. Similarly, where the State has established drinking water standards that are more stringent than the Federal MCLs, these may be applicable or relevant and appropriate.

There are two water-bearing zones underlying the site. The uppermost zone is unconfined. The next zone, which is separated from the upper zone by a clay aquitard, is referred to as the confined aquifer. Where the potential ground water pathway of concern is through a surface water discharge, risk-based numbers often form the basis for establishing protective levels for the saturated zone. This approach is also utilized where MCLs are not appropriate. Specific factors that may influence the appropriate risk level include:

(1) Feasibility of providing an alternative water supply;

(2) Current use of the ground water;

(3) Effectiveness and reliability of institutional controls;

(4) Ability to monitor and control the movement of contaminants in the ground water.

Also factored into decision making should be:

(1) Ability to limit extent of contamination;

(2) Impact of contamination on environmental receptors;

(3) Technical practicability and cost of remedial alternatives.

Clearly, MCLs are not legally applicable to the shallow unconfined ground water source at the Sheridan site. This is not a drinking water source being supplied to at least 25 individuals at least 60 days out of the year. Indeed, this source is not supplied to any individuals, any days of the year, and institutional controls will be implemented to prevent its use in the future.

The inapplicability of MCLs does not mean that this ground water source does not need to be protected to levels that will avoid an endangerment to human health and the environment. Since the only receptor for this ground water source is the Brazos River, it is expected that this standard can be achieved by ensuring that any potential impact from the site on the ground water will not result in levels of constituents that, once discharged to the river, would have an adverse impact on human or aquatic receptors. However, this must be confirmed through the demonstration that an alternate concentration limit is appropriate for this site. This demonstration is currently being prepared and it is believed that such a demonstration can be made.

Taking into account the mixing zone of initial dilution that would result from the seepage of the shallow sand into the Brazos River it is possible to back calculate permissible ground water concentrations from applicable water quality standards.

Source control remediation would then need to assure that these levels were never exceeded in the shallow unconfined ground water zone.

ARARs for Air Emissions

Based on a review of all potentially applicable air emission-related regulations and standards, the only "legally applicable or relevant and appropriate requirement" for air emissions at the completion of remediation is specified in Section 4.01 of the Texas Clean Air Act, which provides that "no person may cause, suffer, allow or permit the emission of air contaminants or the performance of any activity which causes or contributes to, or which will cause or contribute to, a condition of air pollution". "Air pollution" is defined "as the presence in the atmosphere of one or more air contaminants or a combination thereof, in such concentration and of such duration as may tend to be injurious to or to adversely affect human health or the environment, animal life, vegetation, or property, or as to interfere with the normal use and enjoyment of animal life, vegetation, or property."

To assure compliance with this standard, each of the proposed remedial alternatives contains provisions for periodic ambient monitoring to verify that site conditions existing at the completion of remediation are not causing or contributing to a condition of air pollution. All of remedial actions are designed to insure the emissions are in compliance with this ARAR.

APPENDIX B

ADMINISTRATIVE RECORD INDEX

FINAL

Not included

SITE NAME: SHERIDAN DISPOSAL SERVICE

SITE NUMBER: TXD 062132147

INDEX DATE: 12/29/88